

# THE PHOTOGRAPHIC PRIMER



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J·C·MILLEN·M·D·

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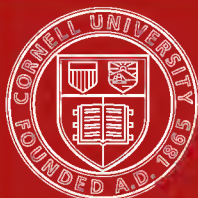
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# THE PHOTOGRAPHIC PRIMER



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THE  
**Photographic Primer**

*A Manual of Practice*

BY

J. C. WORTHINGTON & J. C. MILLEN, M.D.



*Riverton*

THE RIVERTON PRESS

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*AND*  
*J. C. MILLEN*

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## PREFATORY NOTE



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*This little manual, which now seeks audience, is not the mouthpiece of a manufacturer, neither have the authors a private axe to grind. It is written to give a clear, simple definition of photographic practice in its primary form, as the uninitiated must approach it. The PRIMER can lay no claim on the professional operator, and goes no further in the path of photographic work than the production of a perfect picture by the simplest processes. For those who wish to experiment with the endless procession of new plates, new papers, and new methods, there is abundant help ready to hand in the photographic literature of the past ten years; but to one who knows nothing of the art, who has never looked into the mysterious simplicity of a camera box, and to whom a lens is but a bit of glass, the PRIMER may appeal with confidence.*

*The authors have sought to give the cardinal points in photographic work in epitomic form, and in this respect the manual may be found not only a guide to the beginner, but a reference book of constant use to the more advanced student.*



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## PART I





## SECTION I.

### *THE APPARATUS.*



THE CAMERA, in its simplest form, is a box whose two ends can be made to approach one another at the will of the operator. In this simple shape one end is firmly secured to a frame at the bottom, the other end traveling to and fro, either in grooves or on a notched metal track, guided and controlled by a pair of toothed wheels. As the space between the two ends is required to vary for every different picture, a flexible case or BELLOWS unites them, the bellows making the box dust-tight and light-tight. One end of the box carries a panel with a rabbeted edge, secured by a button. The panel can be removed by turning the button and slipping the panel out of the rabbete. This same end of the box, with its panel entire, slides up and down between two side posts, so that it may be raised from one to three inches, and as the case or bellows is secured to the back of this sliding front, it always follows the

movement of it. The panel of the sliding front has a circular hole cut in it.

The fixed, or opposite end of the box, is made with a door the entire size of the end. The door is really a narrow frame, with a piece of fine ground glass set in it, and the door or ground glass frame opens in different ways in different makes of cameras. In some it is hinged; in others there is a side sliding movement, by which the ground glass is separated from the back of the box so that a space of about half an inch is opened, into which the PLATE-HOLDER (to be described later on) may be slidden.

The grooved or notched track-frame at the bottom, on which the front of the box travels, is usually hinged back of the center of its length, so that, when the ends are brought close together by the telescoping of the bellows, the longest part of this frame or bed may be folded up against the front of the box, making the whole camera compact for carrying; the folding up has nothing to do with the operation of the camera. Roughly speaking, this is the whole of a camera box, except two other features of its construction, which will be noted further on.

The LENS entire is a piece of brass tube, called the *mounting*, carrying the actual lens or optical glass which condenses and projects

the picture. The tube screws into a brass plate, which is firmly secured to the sliding front of the camera by small screws. On the front of the tube is placed a small CAP of leather, like the lid of a pill box. A *single* lens has one glass or lens; a *double* lens two glasses, the lens being held between two thin rings which screw together in the tube, forming a round frame or support. The position of the lens in the tube varies according to the character of the lens. In front of the single-lens glass, and between the glasses of the double lens, thin metal disks, with holes of varying sizes, may be inserted; or in some lenses the holes are all on one disk, the disk revolving on a center, bringing either hole of the series in turn before the exact center of the lens glass, at the will of the operator. These disks, in whatever form they work, are called stops or diaphragms.

The glass or lens has many forms, varying for special purposes, and it may be here said that these variations are real and essential, and that in the manufacture of lenses there is little opportunity to create useless forms or to produce an article simply to sell, for the lens is under the dominion of strict optical laws. In some lenses the section—*i. e.*, if cut through the center of its thickness—shows flat on one side and convex on the other; in

others there are two convex sides, while another variety is slightly concave on one side and convex on the other. But the beginner had best not lose himself in the mazes of lens lore.

The object of the lens is to gather the picture or view towards which it is directed, and cast the condensed image upon the piece of ground glass in the door at the back of the camera or box. The nearer the subject is to the front of the lens, the greater the distance between the lens and the ground glass, and vice versa. It is for this reason that the two ends of the camera must be made to approach one another or to recede at will. At almost any distance from one another some sort of blurred image will be seen on the ground glass, but there is a right point, at which the image is presented sharp and clear in all its parts, and the movable end must be operated backward or forward until this clear, clean-cut picture is seen on the ground glass. When this condition is arrived at *definition* is secured. A good lens should always make every part of the picture clear on the ground glass, not only in the center, but at the extreme corners; it must not distort or twist the square lines of any object which it casts upon the ground glass, and it must be of a *focal length* adapted to the extension of the bellows of the camera.

Focal length means simply this, that when the image on the ground glass is perfect, some lenses require greater distance than others between the front and back of the camera to produce the same image at the same distance from the lens, so that a camera which could only be extended *eight inches* would not be adapted to a lens whose focal length was *twelve inches*.

The lens, as has been said, *gathers* the picture and reduces it to the size of the piece of ground glass, presenting it before the eyes of the operator in the same brilliant, colored form as on the table of a camera obscura. Every object within the compass of the lens is shown faithfully; if it is moving, we see it moving on the plate; if it is at rest, so it is shown in the miniature picture. Shift the camera but a quarter of an inch, and a new section of view is presented, so that to secure the image of one group of objects the box or camera must be held rigidly to one spot. But the camera must needs be moved to many places in order to be generally useful, and a temporary but *temporarily permanent* rest for it is required, a support that can be easily carried. Three sticks held the cooking pot of the earliest settler in the wilderness, and three sticks, or the TRIPOD, do duty with the camera. There are about ten thousand kinds of

tripods, and some of them have virtues. Three sticks, jointed to a plate at the top, and with the bottom ends of the stick pointed, so that each will hold in the ground when spread, constitute the simplest form. But, as in the instance of the camera box, which it would be inconvenient to carry outspread, so a parcel of sticks five feet long would be in the road when moving from one place to another. The folding or sliding principle is, for this reason, applied to the tripod, and some of them are made so that each individual stick slides into itself twice or thrice, or is hinged at the middle and folds over, reducing the long-legged support to a small bundle. In most of the tripods the head can be detached and carried separately; in some of the cheaper forms it remains permanently fixed to the group of legs, and in others the camera base has the tripod set into it as a part of the camera itself. Where the camera and tripod head are separate, the head is attached by a screw or clamp, and the best cameras have a turn-table head, so that the camera box can be revolved at will as upon a pivot, and yet remain rigid at any point. By spreading or gathering the legs, or by sliding the telescoping legs, the height of the camera can be altered to suit the operator's purpose.

There are but few things to be said about a

tripod, and they might as well be set down here entire. It must not be shaky, or so lightly made as to be easily broken. Convenience in carrying is frequently gained at a sacrifice of these great virtues, and the after result is generally profanity and bad pictures. When you are shown a tripod in a store, see that it stands well; put your hand on the top, with the legs spread, and try to oscillate it. If it is in any way shackly don't have it; take a heavier one, or one with less joints, and see that all these joints operate easily and are held firmly. A tripod in which you can shorten any one leg at will, is generally found most serviceable. Examine also the method of attaching the camera box; it ought to be done quickly, and when done it should hold rigidly and firmly, nor should these combined virtues prevent the easy detachment after you are through with it. Using reasonable care on these points, any fool ought to be able to select a good tripod.

With the camera box mounted on the tripod, a lens in its place on the front board, and pointed towards some pleasant outlook, take the cap off the lens and try the movement of the camera front, shifting it backward or forward to bring the picture clear on the ground glass. You at once experience a difficulty; you can see nothing on the


ground glass! The light of the day on the back of the glass prevents the reflected image from being seen. Your head and the glass must be shut in companionable darkness, and the best way to accomplish this, and see the picture, is to throw a cloth over the end of the camera box and draw it closely in around your face, so that the "garish day" is shut out, meanwhile looking *at* the ground glass, and not attempting to look *through* it. With the cloth over your head, the only bright object for you is the picture on the glass, and if you will remember the injunction just given, you will have no difficulty in seeing it, and must not be disturbed, when you do finally see the picture clearly, to find it *upside down*. A half dozen experiments will reconcile you even to this, without standing on your head or trying to see it in any other way than frankly upside down, and the humblest adorer of beauty must enjoy the miniature picture even under such apparent disadvantage.

While your eyes are coming back to their natural feeling in daylight, it might be well to think about the covering you have over your head. The profession call it a FOCUSING CLOTH, and a square yard of rubber cloth (like a piece of a waterproof cloak), or a piece of black velvet, is generally used. The velvet is best; it does not smother the opera-

tor like the rubber cloth, for it lets some air through, and when the wind blows it is not so much like a sail. It is pleasanter to the face when it touches it, clings closer to the camera and the head, and packs in with your camera much better than the more unyielding rubber cloth. Use a plain, every-day focusing cloth like this until you know more, and don't experiment with substitutes until you have used some of your good money in making a few first-rate pictures. .

Put the cloth over your head again and look at the ground glass picture. Raise and lower the sliding board which holds your lens; swing your camera box on the tripod head so that it takes in a different picture; move your camera front backward and forward on its bed, and get the knack of doing this evenly and slowly while your head is covered. To be able to get the picture that you *think* you want (you will not learn what you really want for a month or two) clear and sharp on the ground glass, and to be sure that it is sharp and clear, is enough for several experiments, without thinking of "taking a picture."

The back of the camera box has been described as having a door or frame with ground glass in it, and it has been noted that this ground glass frame is either hinged or has a side movement which will allow of the intro-

duction of the PLATE-HOLDER. This important feature in photography consists of a light wood frame of which a section looks something like this:  A deeply recessed groove on each outer edge of the frame receives a thin slide of wood fiber or compressed paper, and a central division of the same material separates the case into two distinct, shallow panels. At the other end the slides pass through the groove, which here cuts entirely through the frame, the end of these slides being made with wood ledges, which cover the slit through which the slides pass, so that when the slide is in no ray of light can enter the slit; while when the slide is withdrawn a spring flap covered with felt closes the slit as the slide is drawn away. When the plate-holder has been placed in the space between the ground glass frame and the camera box (which it usually fits against in a rabbete), and the *slide on the side next to the box* removed, the shallow compartment on that side of the septum is in the complete seclusion and darkness of the interior of the camera box, granting that the lens tube is covered by its cap. If a piece of glass were first placed in this shallow frame of the plate-holder, the face of it nearest the lens would be exactly in the position of the ground glass which we have slid to one side or folded.

When the holder is not in the camera, and the slide is closed or pushed in, the piece of glass is in a flat compartment, light-proof and dust-proof. As the piece of glass can occupy the same place as the ground glass, it follows that the picture cast on the latter would be cast on the glass when the slide is drawn, and it is thus that the image we have seen on the ground glass is cast upon the sensitive plate, which we will place in the holder later on. For the present we will experiment with a piece of glass of the size of the plates adapted to the camera— $3\frac{1}{4} \times 4\frac{1}{4}$ ,  $4 \times 5$ ,  $5 \times 7$ , or whatever it be. To put these pieces of innocent, plain glass in the plate-holder in broad daylight is simple enough. The slides are removed from both sides of the holder. At one end, the opposite from which the slide enters, a piece of flat brass bow-spring receives the end of the glass and allows it to be pushed down until the glass drops against the septum or middle division, and the opposite end is held under a little ledge, being thrown back there by the spring at the end first inserted. When this operation is completed with both sides, and the slides are snugly pushed in, there are two pieces of glass resting in seclusion. All plate-holders do not have exactly the same arrangement for holding the glass, putting it in and

removing it; but every plate-holder ought to be simple enough to be easily handled *in the dark*. For after you have examined your holders well, and tried at putting the plain glass plates in them in the light, you will henceforth have to meet them only in the dull obscurity of the dark room, and for that matter you will be well off if you learn to handle them while shut up in a dark closet, with all the lamps or lights in the house extinguished and a dark night outside! Deeds of darkness abound in careful photography, and any kind of light, save ruby or orange, has a skittish way of treating your plates, so that by all practicable handling in the dark you gain greater security.

A good plate-holder has these virtues: It is as small as possible, and as light as possible consistent with reasonable strength; it receives a plate easily and comfortably, and yields it up as quietly by sense of touch; while it ought not to be exposed in broad sunlight, it ought to be so tight that you could do so with impunity; the slides should fit tightly and draw freely, and there ought to be some device to prevent Mr. Careless from pulling them out when they happen to be in a public position. Finally as to plate-holders just here, every slide of every plate-holder ought to have a record tablet of celluloid on

the end from which it is drawn, and this tablet should be big enough to let you write in pencil, in modest size, the kind of plate, the date it was put in the holder, the subject, date and time of exposure, and the *number of the stop or diaphragm* used. All this amounts to but a few words, but such a record, which you can transfer to your house record if you wish to, but which at least tells you all about the plate and the holder until you want to develop the negative, is valuable, and saves the wastage on plates. Every man who has carried a camera has probably, at one time or another, filled his plate-holders with care, made a mental register of their contents, arranged them in his camera case in a certain order, and ten days afterward, having been prevented from using them, found that he was unable to tell whether No. 1 was slow or No. 2 fast—sometimes so badly off as not to know whether a plate had been used !

This record system is much more satisfactory than the usual note-book. Neatly printed and arranged note-books are for sale everywhere, but who uses them ? They are unpractical unless the photographer be a man of immense resource in patience and care, for the note-book is but another impediment to action. Unless he ties it to his camera, it will generally be left in the dark-room, and if

he wants to make a memorandum in the field, the photographer finds a card or envelope back his only resource. With the plate-holder tablet, the record and the plate are together until he reaches the place or time for development, and it can then be put into a permanent note-book, if such a proceeding is desirable.

The few items mentioned thus far constitute the entire equipment for an amateur, so far as mechanical apparatus goes, necessary to produce a negative. Everything except the tripod should stow compactly and neatly into a light canvas-covered case, and there are cases which hold the tripod as well.

It is difficult to advise as to the selection of a camera. There are many good makes, and the scale of cost is applicable to almost every size pocket-book. The surest way to get a good article is to go to a maker whose wares are well established, and who gives no sign of quitting business. The wood of the box ought to be well seasoned and finished; it ought to be put together so that strength and lightness are marked features, and the metal work well polished. The difference in a pound or two of lessened weight is marked when one has to carry the instrument for many miles, although it does not seem to be so essential while simply handling the article

in the store. The bellows in the cheaper grade of cameras is often untrustworthy, and cracks and rots at an early day, so that surety as to its quality is an important consideration. For the amateur who does not know how far he will carry his photographic experiments, it is a safe course to buy a small camera at first. The main reasons are three: The expense is less, a good 4 x 5 camera is better than a medium 5 x 8, and the cost of plates, one of the greatest items in the pursuit, is restricted. If the student finds photography pleasing, he can at a later day exchange or sell his small camera and secure a larger one on fair terms (for the manufacturer!), and the experience he has already gained will make the selection of the second camera more satisfactory, for by that time he will know the kind of work he likes best, and the second choice can be made in the light of this knowledge. Again, the handling of large plates in development is a serious drawback to the beginner, and the possible misadventures with them can very soon lessen his enjoyment and his bank account.

Do not buy a "complete outfit!" Buy what you want; or rather, what is made to do the kind of work you *think* you want to do. The articles can be selected separately, according to the list given at the end of this

chapter. Your inclination will soon seek to make you add to it, and with care you can, of course, select many things which will be of advantage to you, but which are not spoken of here, but do not buy anything more than we recommend to commence with; for the authors feel sure that the hour of gratitude for this advice will not be lacking.

\* \* \* \* \*

The apparatus for the indoor work is but a small affair. Trays for development are needed. Unquestionably the hard rubber are best, since they combine lightness, cleanliness and strength. You can let them fall with impunity, although there is no occasion for letting them fall at all. The trays should be of a size to receive two plates, *not* because you want to develop two at once, but for reasons shown later on. The trays are about an inch or so deep, and one corner should have a lip for pouring solutions from them. For measuring the solutions you ought to have two graduated glasses, one holding four ounces, fluid measure, and the other eight ounces. If you can get the graduates with the scale in white enamel they will be handier, and you will bless them in your dark room. For holding the solutions, a half dozen glass-stoppered bottles of from 5 to 20 ounces

capacity are needful. These bottles may be empty cologne water bottles, or any bottles which have not been used for fluids which may have left some remnant behind. If you use old bottles, *be careful about this*, and as a precaution for even the cleanly cologne water bottles, wash them by filling with a moderately strong solution of citric acid, *warm*, allowing the solution to remain in the bottle for half an hour and briskly agitating it.

The light to develop your pictures by in the dark-room is as serious a matter as your camera. Lamps for the purpose are sold—all kinds. They are mostly frauds. What you want is to get a good light of a deep orange-ruby tone, the strength of it being sufficient to see everything clearly in the dark-room. If your surroundings afford an opportunity to put an ordinary light, lamp or gas, in a room next to your dark-room, and you can have a 12 x 12 inch sheet of orange and ruby glass in a small aperture, otherwise light-tight, between the two rooms, you will have as nearly an ideal condition as you can expect; or if you develop in daylight, the 12 x 12 light can be in a screen used to entirely cover the outside window, in which case it will be necessary to dim the strong daylight still further by putting a sheet of yellow "post-office" paper between the two glasses. But if you must

use a lamp, be sure that the one you buy is light-tight, except where the light comes through the colored glass, and if it has an oil burner *take it out as soon as you get home*, using thereafter a good *candle* in its place. The developing room is almost always too warm, and you do not need a cook-stove in it; most of the lamps sold are cook-stoves, and in many of them the oil becomes so quickly overheated as to be really dangerous. There is one lamp made, we believe, in which the oil burner *can* be used; it is a thoroughly good one, but Mr. Carbutt's price for it is in excess of what the tyro in photography should expend at the out-start, although not beyond its worth. The problem of light is made simple if one can command an incandescent electric bulb and stick it in his lantern.

Two more pieces of furniture complete the apparatus: a drying rack for plates—a very simple wooden rack, in which each plate can have a groove to stand in, with one corner pointed downward, to drain and dry—and a printing-frame, to use hereafter when the time comes. Neither article has any particular points, and your purchase, so far as these go, can be made with blind confidence in the dealer.

The list of necessities, then (outside of chemicals and a few minor trifles to be men-

tioned), for *all* your work, from the field to the completed, mounted picture, is as follows :

A CAMERA.

(The Camera comprises the bellows-box affair which you have often seen in the windows. With it alone you cannot make pictures any more than you can with a clock-case.)

THE LENS.

(Comprising the mounting or tube, with the lens glass or glasses, the stops or diaphragms, the leather cap, and the base-plate to secure it to the Camera. There are many classes of lenses, and you can scarcely do all kinds of photography with one lens. But you do not want to do all kinds to commence with, and you can learn a little more about the matter in the chapter devoted to *Exposure*.)

THE TRIPOD.

(About which enough has been said.)

THE PLATE-HOLDERS.

(Three double plate-holders—double means holding two plates—are sufficient for you now. The six plates which they will hold will be enough for you to spoil in one day. Plate-holders are like extra collars and cuffs: you can buy them when you want them, one or a dozen at a time.)

THE FOCUSING CLOTH.

(Don't forget to select a velvet or velveteen one; a piece of velvet a yard square, from an old dress, or from any store, is all it means; there is no magic in it.)

THE RUBBER TRAYS.

(For developing. Three of these are necessary for the *negative* development and three for the *print* development.)

THE GRADUATES.

(If the base is broad and they sit well, the two glasses will be all right.)

THE BOTTLES.

THE LANTERN.

THE DRYING-RACK.

THE PRINTING-FRAME.

Go to an honest store for these things, and neither seek to show the dealer that you are a master in photography or forget yourself so far as to betray that you are grossly ignorant, and so God be with you !

## SECTION II.



### THE DRY-PLATE.



THE modern dry-plate has yet to be superseded by a new wonder in the same family. It is one of the simplest yet most mysterious affairs in the world, and its life commenced so recently that a man can claim to have been born before it and yet not assume the airs of a patriarch. To-day dozens of factories are turning out hundreds of boxes of dry-plates every twenty-four hours.

A box, in the ordinary smaller sizes, contains one dozen plates, each quarter or half dozen plates wrapped in a double black or dark paper, and the individual plates usually separated by a narrow card strip at the edge, or in some other fashion. The dozen plates are packed in a stout pasteboard box and sealed up with edge wrappers, or wrappers covering the entire box. On almost all the boxes will be found the injunction to keep in a dry place, stand on edge and open only in a *safe* light. If they are kept in a damp place the moisture

will invade even the careful packing and cause deterioration ; if they are laid flat and box piled on box, or something else piled on them, the chance friction or pressure may cause them to rub or the glass to break ; and finally, if even the slowest grade receives any white light—day-light, lamp-light, electric-light or candle-light—you can throw the box into the dust heap, for you have only a dozen bits of glass 4 x 5, 5 x 7, or as the case may be : the *magic* has all departed. When these plates go into the boxes they are destined to have their first glimpse of daylight only as prisoners in the plate-holders of a camera.

If we could take one of the plates out of the box and carry it to the broad light of the window without injury, we would find a piece of glass of the size designated on the outside of the package, and covered on one side with a smooth, rich, cream-colored substance, so even that its translucent effect is like that of a piece of carefully tinted glass. This coating is the thing the light will ruin, and it is the medium for producing the negative which, in turn, produces what we ordinarily call a photograph. The process by which the plate is coated is an interesting one, but is not to be described in detail in this book. The coating is composed of Bromide and Iodide of Potassium, Nitrate of Silver and Gelatine, in cer-

tain proportions. The union of these chemicals produces an insoluble compound, in a fine state of division, held in suspension in the gelatine, which, before it is used for coating the plates, is boiled and then washed until the by-products of the combination are largely eliminated. The extent of the "cooking" governs the sensitiveness of the film, and, consequently, the activity of the plate when under exposure, so that very fast plates are "well-done" and slow plates "rare," if we apply cook-book language to the matter.

The light, coming in contact with this coating, oxidizes the salts of silver and blackens it, and this change is developed or brought out by the developer. The light does not produce any visible effect on the plate, although if kept long enough in the light it becomes overcast with a bluish tinge. Contact with a developing fluid at once causes the oxidized sections to blacken in gradation as the intensity of the light in the view has fallen on the plate, while the dark or black tones in the view simply leave the emulsion with which the plate is covered unattacked in those particular places, and consequently they appear as clear or nearly clear glass after development. All of the wonderful delicacy and the merging of the delicate degrees of light and shade in nature are thus reproduced simply by

a chemical agent bringing them to one common ground of degrees of darkness. If you take a sheet of clear glass and flow some drawing ink on its surface with a brush, you will have a greyish black translucent spot. Flow another spot, allow it to dry, and give it a second coat, and then another spot in which you repeat the flowing operation the third time. There will then be on the glass, when held to the light, three distinct *shades* of blackness, the first letting some light through, the second less light, and the third perhaps none. This piece of glass serves to roughly illustrate the whole nature of the **NEGATIVE**—the name given to a photographic plate after exposure in the camera and development. The negative is simply a reverse image of the light and shade values in the outlook the lens of the camera has been pointed at, these same values, however, being so delicately graded and reproduced as to far surpass the brush of any artist. To describe further the exact chemical action of the image of light on the sensitized plate does not seem to be necessary in this book.

As has been stated, the riper or the more prolonged the amalgamation of the chemical constituents of the coating, the more sensitive the plate, and the more sensitive the more rapid. Plates are made, generally speaking,

in three distinct grades: *Very slow*, for the purpose of photographing drawings, pictures and still-life; *medium*, for landscapes, architectural work, etc., and *rapid*, for moving objects, portraiture and general work, while we might say that there is a fourth distinct class, the *very rapid*, whose exposure cannot be measured by the human sense. The two extremes are the most difficult for the amateur to work, and until he becomes well advanced in his experiments he had best leave them alone, unless he wishes to contribute to the support of the plate makers. The very slow plates require skill in timing and development, and the very fast require a good "snap shutter," which will cost nearly as much as the camera.

All of these plates are graded to the reading of what is called a "sensitometer," and the package is marked "Sens. No. —," with the grade mark used by the manufacturer to designate the particular quality or speed.

It is a wise course—and you will find this threadbare statement in every photographic book, big or little—it is a wise course to cling to one brand or make of plate and learn its qualities. There are a half dozen makes on the market which are all *the best* for some one, for the character of the plate is like the character of a friend, it comes out more and more

thoroughly by continuous acquaintance. It is always a mistake for a beginner to buy a box of Cramer's plates, then a box of Seed's, and again a box of Carbutt's, for each make will have a subtle difference, and the results are likely to be uneven when this changeable method is followed. All of these plates are good, and if the first dozen plates you use are unsuccessful, blame it on yourself. Try a second dozen, and think where you may have erred. If the second dozen all fail you, try a *third*; but there—unless you are an unmitigable blockhead, in which event you will never make a negative with any plate—there you may stop, and conclude that something is wrong with the plates. If there is something wrong, any reliable maker will see that you have justice, but it must be a very rare occurrence for a man to use two dozen plates without getting some good results, and they do not need to be all good to assure you that the plates are not at fault.

The dry-plate, from the moment it leaves its wrapper until the end of its life, which ought only to be when some unkind fate breaks the glass, should be handled with respect and care. Treated thus it will give prompt response and yield you generous return. One-half the bad pictures are caused by careless handling of the plate at some time

in its life. Remember that its coating is not only affected by light, but that it cannot be rubbed, scratched, or brought in contact with heat without suffering or being ruined. Practically the coated face ought never to be touched by anything until it meets the developer, although experience will teach the latitude in these matters. But the best way to start out is to make up your mind that it shall not be touched by anything, and the degree of latitude in handling will grow upon you as you learn.

Finally, treat the wrapper of your box of plates as sacredly as the seal of some one else's letter, until you are in your dark-room, and then you may open it if you intend to quickly shift the plates to your plate-holders. Don't open the box to *look at* the plates; it will do you no good, and there is every chance that it will do the plates harm; *very fast* plates ought to be handled only in the dark until the moment comes for them to enter the developing tray.

### SECTION III.



## THE DEVELOPER.



WHEN in the dark-room the dry-plate is taken from the plate-holder of the camera, after exposure, no apparent change, as we have said, can be noted.

The same cream-like hue extends over its surface, notwithstanding the fact that it has been born to new life in the camera, and only awaits an active agent to make that new life visible.

The silver salts of the emulsion coating have been oxidized by the light. The developer sets its seal on the work and by its chemical action completes the process, causing these oxidized spots to become black with more or less intensity, according to the strength of light in the image which the lens has cast upon the plate. The plate, before it touches this active fluid, can be said to have no *character*; the developer brings out or develops all the character which the lens image has left there.

The developing agents have increased in number to a remarkable extent, and in place of a half dozen orthodox solutions, we have to-day every variety in kind and action. To the professional photographer these are of constant use, since, used in combination with his experience, the results are made to vary to suit his special need. Experiments with many kinds of developer are traps for the amateur in his early days, leading him into the same sort of scrapes as the promiscuous wandering in the field of dry-plates. A developer, and its action on the plate, needs to be studied in the same fashion as the plate itself, and to do this properly the developer ought to be used continuously. At the beginning it is wiser for the student to limit the kind of pictures for awhile, and not try to take portraits, landscapes, still-life, etc., until he has learned to take one kind of pictures well. The range is very much easier afterward, and by thus limiting the kind of subject he can limit the character of his developer. In a short time he will know Pyro or Oxalate or Hydro in all their shades of feeling, and then, if adventurous, can go out on the vast and increasing sea of developing solutions.

The following formulæ have been selected with care, and are given here under their

proper heading in the book, although the beginner will find them more interesting after he has completed the reading of Section II., in Part II., on DEVELOPMENT. Each developer has a number attached to it, purely for convenience in referring to it later on.

#### No. 1. HYDROQUINONE DEVELOPER.

A {	Hydroquinone . . . . .	18 grains
	Sulphite of Soda (crystals) . .	100 grains
	Citric Acid . . . . .	6 grains
	Bromide of Potassium . . . . .	3 grains
	Distilled Water . . . . .	2 ounces
B {	Caustic Soda . . . . .	18 grains
	Distilled Water . . . . .	2 ounces

Use A and B in equal parts when making ready for development.

#### No. 2. PYROGALLIC ACID DEVELOPER.

A {	Sulphite of Soda (crystals) . .	1½ ounces
	Water . . . . .	4 ounces
B {	Carbonate of Soda . . . . .	1¼ ounces
	Water . . . . .	4 ounces
C Saturated Solution Bromide of Ammonium		

Keep the above as *stock* solutions, in separate bottles, and when ready to develop take

Water . . . . .	4 ounces
Pyrogallie Acid . . . . .	25 grains
A . . . . .	1 ounce
B . . . . .	1½ drachms
C . . . . .	2 drops

Weigh out the dry Pyro (Schering's re-sublimed Pyrogallie Acid is best), and dissolve in the water; then add the other ingredients. Never use Pyro developer except *fresh*, if you

desire good results. Thus used this developer works finely, and will never stain.

Should you have a negative stained by Pyro, the stain may be removed by soaking in

Sulphate of Iron . . . . .	1½ ounces
Water . . . . .	½ pint
Sulphuric Acid (c. p.) . . . . .	1 drachm
Alum . . . . .	½ ounce

### No. 3. PYROGALLIC ACID DEVELOPER.

(As successfully used by Dr. Jesse C. Millen.)

Each fluid ounce of the developer contains

Water . . . . .	1 ounce
Carbonate of Soda . . . . .	10 grains
Sulphite of Soda (crystals) . . . . .	20 grains
Pyrogalllic Acid . . . . .	2 grains
Bromide of Potassium . . . . .	1 grain

The Pyro is always to be kept dry, weighing it out and dissolving it in the water of the formula when ready to use. The other ingredients may be made into stock solutions by dissolving larger quantities in water in separate bottles in the proportions given above. (For instance, an 8-oz. stock solution of the Carbonate of Soda would be made by taking 8 ounces of water and dissolving in it 160 grains of the Soda, so that each *half* ounce of the fluid would have 10 grains of soda, and making the Sulphite of Soda solution in the same way would give each half ounce of *it* 20 grains of the Sulphite. The united two half ounces would then make one fluid ounce containing 10 grains of the Car-

bonate, and 20 of the Sulphite.) For *each* ounce there can then be added 2 grains of the dry Pyro, and 1 grain of the Bromide.

When fresh, this developer works clear and bright, and does not stain. When the exposure is anywhere near the right time, the resulting negatives are fine and sparkling.

#### No. 4. PYRO-AMMONIA DEVELOPER.

Pyrogallic Acid . . . . .	8 grains
Bromide of Potassium . . . . .	8 grains
Ammonia (strong) . . . . .	8 drops
Water . . . . .	4 ounces

For under-exposed plates and snap-shots, this is one of the best developers ever formulated. It does not fog the negative, but gives it a brilliant quality, full of detail. It *does* stain both the negative and the fingers, but this interferes with the final result only in making the printing very slow.

#### No. 5. METOL DEVELOPER.

(As successfully used by Mr. J. L. Dillon.)

A {	Metol . . . . .	1 ounce
	Water . . . . .	60 ounces
	Sulphite of Soda (crystals) . . .	8 ounces
B {	Carbonate of Soda . . . . .	8 ounces
	Water . . . . .	60 ounces
C {	Bromide of Potassium . . . . .	8 ounces
	Water . . . . .	16 ounces

In using take equal quantities of A and B, and if the development proceeds too quickly,

use a quarter to a half ounce of C to each 8 ounces of the developer.

The keeping qualities of this developer are excellent, and it does not stain either the hands or plate. In combination with the ACID FIXING-BATH, it makes an ever-ready developing and fixing outfit. The old solution can be used for over-exposures, the fresh for normal exposures.

#### No. 6. METOL-QUINOL DEVELOPER.

Warm Water . . . . .	27	ounces
Metol . . . . .	15	grains
Sulphite of Soda (crystals) . . .	1½	ounces
Hydroquinone . . . . .	1	drachm
Bromide of Potassium . . . . .	4	grains
Carbonate of Potassium . . . . .	5	drachms

#### No. 7. IRON OXALATE DEVELOPER.

A {	Neutral Oxalate of Potash . . .	16	ounces
	Hot Water . . . . .	48	ounces
	Acetic Acid . . . . .	3	drachms
B {	Proto-Sulphate of Iron . . . . .	16	ounces
	Hot Water . . . . .	32	ounces
	Citric Acid . . . . .	¼	ounce
C {	Bromide of Potassium . . . . .	½	ounce
	Water . . . . .	1	pint

Let both solutions cool off before use. They will keep for months in separate bottles. The IRON (B) solution should be well stoppered, and rejected if not perfectly clear and green. Exposing in sunlight occasionally will keep it in good condition.

To use, take 6 ounces of A, 1 ounce of B, and ½ drachm of C, mixing them in the

order given. Under no circumstance must A be poured into B. As a general caution, be careful to avoid the contamination of your Iron Developer with Pyro.

RODINAL is an extremely simple and safe developer for the beginner. It is put up and sold in one solution, simply requiring dilution with water to be ready for use. The results are clear and brilliant, and sure to give satisfaction.

To briefly review the various developers we have mentioned: No. 1, Hydroquinone, gives very satisfactory plates, and is extremely clean for the amateur to handle. It also has the virtue of being in one solution, and thus helps towards simplicity. The plates developed with it are hard and sharp, generally speaking, and it suggests itself as an excellent solution to use on negatives of line drawings, or any work requiring sharp definition, rather than soft effects. Skillfully handled, it can, of course, be used on almost every variety of exposure.

The developers Nos. 2, 3 and 4 represent the Pyro group, or those into which Pyrogallie Acid enters as an active agent, and the memoranda already given are sufficient to show the range of their work. Nos. 5 and 6, the Metol and Metol-Quinol developers, represent two reliable formulæ for this very use-

ful agent (Metol). The keeping qualities of Metol are remarkable. It is clean, both in connection with the plates and hands; its rapidity and power while acting on the plate, and its efficacy in bringing up detail on underexposed plates, are qualities that seem to be possessed in great part by it alone. The stock solutions, in separate bottles, keep indefinitely, and even the mixed solution has a very great length of active life, so that the expense of new chemicals and the time used in mixing them are both reduced.

The Oxalate Developer, No. 7, is not adapted to fast plates or fine detail, requiring very skillful handling to secure these effects with it, but for line negatives, photographs of engravings, or where black and white effects are desired, it is extremely useful.

The last developer mentioned, RODINAL, we consider the most desirable solution for the beginner, for in his first experiments there is less liability of his making mistakes with it, mistakes which he cannot trace. From every point of view it is one of the most remarkable and excellent one-solution developers which can be bought. Prepared by experienced manufacturers, its quality and strength are not likely to vary, and comparative results can be safely made.

INSTANTANEOUS EXPOSURES have their suc-

cessful qualities better insured if placed for from 3 to 5 minutes before development in the following solution :

Carbonate of Soda . . . . . 5 drachms  
Distilled Water . . . . . 7 ounces

This solution may be kept and used again.

#### ACID FIXING-BATH.

A {	Hyposulphite of Soda . . . . .	32	ounces
	Water . . . . .	3	quarts
B {	Water . . . . .	1	quart
	Sulphuric Acid . . . . .	$\frac{1}{2}$	ounce
	Sulphite of Soda (crystals) . . . . .	3	ounces
	Chrome Alum . . . . .	3	ounces

When dissolved, pour B into A.

This is a thoroughly reliable bath, and keeps indefinitely. Frilling (or "crimping") of the film on the plate, or softening are entirely prevented, and clear, crisp negatives result. Fresh Hypo may be added as the solution weakens, or a new bath made up. During cold weather half of B is sufficient.

It is not *necessary* to use the Acid Fixing Bath, as the plates can be fixed in a simple solution of Hypo, as follows :

Hyposulphite of Soda . . . . . 4 ounces  
Water . . . . . 1 pint

All developers *must* be kept cool in summer and not too cold in winter. To keep the fixing bath cool in summer, place a lump of hypo in one corner of the tray, and as it dissolves it will lower the temperature of the solution perceptibly.



## PART II





## SECTION I.



### *THE EXPOSURE.*



**I**FTER you have learned to handle your camera, without attempting to take a picture, and gotten the working of it so easy to hand that you can do everything rapidly and evenly, you will be ready to try your first exposure in the field.

Take your three plate-holders and box of plates (unopened) and go into your dark-room. It is assumed that you have spent a half-hour in this room in total darkness, spying for any cracks which admit daylight or any other kind of white light, and that you have found it absolutely dark. (If you have any doubt on the subject, you can find in the next section of the *PRIMER* a method of proving the integrity of your dark-room.) Light your developing lantern and fix it to cast only the deep orange-red light. Then open the box of plates by running a pen-knife blade around the edge at the bottom of the box where the paper is pasted and lapped over the open

joints. The box is telescopic in form, one half fitting into the other, and some plate-makers pack the plates in a double box, both telescopic and one smaller than the other. Inside the box you will find two flat packages, each wrapped in dark paper and each containing six plates. Remove one of these packages and close the box as you found it. (You need not paste the paper over the joint, of course.) The box with the remaining plates had best remain in the dark-room, or, at any rate, be put away in a dark, dry closet. Take the package of six plates removed and unwrap carefully, keeping a couple of feet away from your lantern or light. Take up a plate-holder and remove both slides, laying them with their outside faces downward upon the table or shelf in the room. Then take one plate from the package, *handling it entirely by the edges*. If you glance along each side, holding the plate at an angle with the reflected light, you will find that one side is highly polished and the other dull. The *dull* side is the *coated* side and in placing the plate in the plate-holder this face is put *outward next to the slide*, the polished side being the clean glass of the back of the plate. You have learned, of course, as previously advised, to put a piece of plain glass in the holder, and so find no difficulty in doing the same thing with the

coated plate. Have ready a small, flat brush of camel's hair, clean and dry, and with its soft surface remove any *dust* from the face of the plate ; and then, if you are sure the plate is in its proper place, put the slide in at once, remembering that as you have laid the slides the top face goes next to the plate. Then turn the plate-holder over and put another plate in the other side, and so on until the three holders are full. You can then come out of your dark-room and put the holders in your camera carrying case. These general directions for filling the plate-holders apply to all kinds of plates except the extremely rapid. When you come to use these you should put them in the holders without using any light, in perfect darkness, by mere sense of touch. To tell the coated side of a plate you have but to remember one thing. Every two plates of the six are packed as couples, face to face, so that the first plate you pick up has its coated surface *down*, the second plate has its coated face *up*, the third *down*, and so on.

The choice of your first subject is left to your own sweet whim, but a bit of landscape is the simplest thing to handle. And a few words on this subject must condense the information you will find in books on the characteristics of views as adapted to pictures. It

must be borne in mind that any real work of art is always limited as to the field of its subject, and that the choice must be made of a *section* of a wide view, else the picture will be a flat failure. Whatever you choose to point your camera at should have something in the foreground, fairly close to you, which will be the strong note in the picture, and give it its character. The human eye can sweep over a wide view and take it all in; the lens cannot, and when it is made to do service as the portrayer of a panorama, the value of the result is depreciated in proportion to the greater field you try to make it cover. This subject you must think about for yourself and by degrees gain the right sense of proportion in *values*, as the relative parts of a picture are called. At any rate, be content with a narrower outlook to commence with, and you will not be so disappointed in your early pictures.

Arrived at the point where you wish to make the picture, take out the camera and put it on the tripod, as you have learned to do already. Take off the lens cap, and with the largest stop in your lens, see what sort of view you have on the ground glass. Study it awhile, and make sure it is somewhere near what you want, moving the camera by swinging it around on its tripod pivot, or moving the whole affair, if necessary. When the ground-glass picture

is what you think it ought to be, then examine your camera carefully and see that it is *level*. If you have a poor eye for such business, you may add a pocket-level to your outfit at a cost of 25 cents. With this level you can manage the whole business quickly and neatly, and after making sure that your tripod is firm and your camera box level *both ways*, take another look at the ground-glass picture. The shifting of the camera to get it level may have left something out of the picture which you wished to have in it. If it is to one side, you can swing the camera on its pivot; if it is above or below, you can raise or lower the *sliding front* board, on which the lens is established, until everything comes on the plate as you want it. It must be noted, however, that the extent of moving the sliding front is controlled by the *covering power* of your lens. If it is only intended to cover or make a 4 x 5 picture (assuming this as the size of your camera), the raising or lowering will tend to make the other margin of the view on the plate somewhat undefined and not sharp. The movement of the front throws the center of the lens above or below the center of the plate, and leaves the part farthest from the center of the lens less sharply defined. It is partly for this reason that, having established the whole of the image you wish to have

on the plate, you should re-focus and get everything sharp and clear. It is presumed that you focused or moved the front board of the camera by means of the controlling screw and notched track when you first looked at the picture, but some little difference may have been made by the movement of the camera to get it level, and you can now fix it absolutely. Try now with one of the smaller stops or diaphragms, slipping it into the slot in the lens tube, or as the case may be, and looking at the ground glass once more. The brightness of the picture is lessened, but the *sharpness* will be found increased. When the picture is sharp and clear *just outside of the center*, secure the sliding front of your camera by whatever device the camera furnishes, and put on the lens cap. With the focusing cloth thrown over the camera, slide in one of the plate-holders, keeping, of course, the slide-pull end next to you. When you are *sure* that the plate-holder is where it ought to be, and not half in, throw the cloth over the entire back of the camera, taking care that an end of it does not cover the lens. You can then raise it until you see the end of the plate-holder slide *next* to the camera, and pull the slide gently out.

At this point let us think, in anticipation, how everything stands related. The cap is

on the lens, hence the interior of the camera box is in total darkness. The plate-holder, facing the inside of this dark box, has the slide removed and the sensitive plate facing the darkness. When you remove the cap from the lens the bright picture you saw on the ground glass will flash over that sensitive surface and print its image there in a few seconds. Before you take the cap away, decide on the time of exposure you will give, and then remove it gently, lingering not.

The time of exposure cannot be taught, but it can be learned with a little thought, care and observation. It cannot be taught, because it varies with the lens, the diaphragm, the plate, the kind of view, and the time of day. The plate-maker, in his circular, generally gives some general memoranda for the use of each kind of plates he makes, and these directions will be useful to the amateur at the beginning of his work.

The time of day and the season of the year in which the exposure is made, each affects the methods used and the result. From May until September the quality of daylight is much brighter than the balance of the year, so that a shorter exposure will give the negative. During the autumn, winter and early spring months a longer exposure is necessary, except in pictures taken with snow on the

ground. The reflected white of the intense light of the snow demands careful treatment and quick exposure. Snow scenes are hard to obtain with light and shade values of a satisfactory sort, but they are often brilliantly beautiful. The time of day at any season is an important factor. The picture taken between 10 A. M. and 2 P. M. on a clear day yields a strong negative in one-third or one-half the time than if taken slightly earlier or later, but one less artistic in results than if taken at an earlier or later hour, since the *long shadows* of the morning or afternoon give added beauty and contrast to the view. In addition to this, the time of the exposure must, of course, be lengthened, and more *detail* is obtained.

It is not necessary to have a perfectly clear day to secure a good photograph, cloudy days yielding results of the most artistic description on account of the less sharp divisions of light and shade, while the strength of detail is also improved, the objects in shadow having a chance to play their full part in the picture. Taken in broad sunshine, the view has such intense contrasts that the shadow under a tree or any foliage will entirely alter the value of the color of any object placed there, often marking the Caucasian subject with the skin tones of a mulatto. It is in the

consideration of these things that the finer study of photographic work opens up such an immense field, and it is only by study and close attention to results under different conditions that you can attain any skill in the work. The most extensive and elaborate description cannot tell you *how* to do the work; it can only help you to see how others have gotten their results.

If the cap has been left off the lens while this digression has gone forward, your picture is ruined; but we presume that you have noted the time you had decided to give the plate, verified it by your watch, and immediately covered the lens with the cap, using the same quickness and quietness of motion as in removing it. It must be remembered that in the fractional instant light is admitted through the lens the plate commences to respond, and if the cap is held hesitatingly before the end of the lens, a blurred image of it will at once start on the plate. It is for this reason that the cap must never pause when being taken off, and must never intrude on the lens when covering it, except to at once and decidedly shut out the view.

The replacing of the cap is the signal for putting the slide back into the plate-holder at once, and thus shutting the plate in its privacy. If another plate is to be exposed on

the same scene—and at the commencement this is not a bad idea, giving the two plates different time and noting the result—some care should be exercised not to move the camera in the operation. The slide securely in, *all the way*, remove the plate-holder and note on its tablet the subject, date, time of day, kind of day, length of exposure, lens, and the number of the diaphragm (the kind of plate being supposed to be already recorded there). For example :

Carb. B.—Mill Dam, Old York——lens—2 sec.  
10/20/95—10 a. m.—fair ; sun—stop No. ——

This record can be transferred to your register at home as “Carbutt B, view of Mill Dam, Old York Road, Oct. 20, 1895, 10 A. M. Time, 2 seconds, etc.” With such memoranda on your plate-holder, you can dismiss the matter from your mind until you enter the dark-room, the notation on this side of the holder showing that the plate is used and must not be exposed again—a danger, by the way, which often leads to vexatious and unfortunate errors. It is odd, after the general knowledge about cameras, extending over so many years, that many people imagine that a dry-plate is capable of receiving an unlimited number of images and somehow keeping them separate. But a plate once exposed is forever married to the recorded image, unless that

image be destroyed by a violent divorce of the sensitive film from the plate, in which event the residue is simply a square of ordinary commercial clear glass.

The diaphragms or stops of the lens are a part of the strictly mechanical apparatus, and they play a leading part in the effectiveness of the picture. Their purpose is to reduce the amount of light passing through the lens, and by this means increase the depth and contrast in the view. The small stop increases the *covering power* of the lens by defining the image at the margins of the plate and sharpening it to the edge. With the open lens, that is, without any stop, the picture is flatter and more uniform as to lighting, and the edges become slightly vague as to detail, while the center of the picture shows clearly cut sharp lines in the image. The insertion of the stop and the cutting down of the light distributes this sharpness more uniformly and carries it to the margins of the plate. The light and shade values of broad, plane surfaces and rounded objects in partial shadow are entirely different, and the relative values are not preserved with the open lens, a broad, flat picture being the result, while the lessening of the aperture by means of the stops brings out the contrasts with vigor and decision. In a rough way an illus-

tration of this can be gained by looking at any bit of view from a window as we ordinarily look at it with the two eyes, and then taking a piece of cardboard large enough to shield the face, and looking through a half-inch hole in it at the same view with one eye. Seen through the small hole, you will notice that the view has gained in distinctness of impression, and that you *see* the light and dark sides of—say a tree trunk—with greater distinctness. The choice of stop or diaphragm opening thus gives a great deal of scope to the skill and observation of the photographic operator, and the best way to learn the value of this is by a simple, practical example. Expose a plate on the same subject for each stop your lens carries, using the same kind of plate, and noting that the smaller your stop *the less the light and the longer the exposure*. If your lens has five stops, the five plates will all vary in character as much as if exposed at different times of the day. Observation of the results will teach you much about your lens.

In the broad field of lenses there are two distinct classes, one called *wide-angle* and the other *narrow*.

The wide-angle lens is made so that it will embrace a more extended field, and is used for architectural photography and interiors,

or in any place where the requirements call for the camera to be used at close quarters with an extended subject. In a perspective the horizon is subtended by an angle of  $90^{\circ}$ , and there are wide-angle lenses made which will take this all in, and some claim to even go beyond that. For ordinary use such lenses are unsuitable, an angle of  $60^{\circ}$  being ample. Distortion of the image on the edge of the plate is often the consequence in using the wide-angle lens in unsuitable places. What is called a *view* lens is most suitable for general work, where a wide view with the camera near to it is not demanded.

For out-door photography, choose a day with very little wind. Trees in motion and a camera oscillating with the impact of the breeze will not tend to produce good results; neither will the focusing cloth add to your happiness, for under these circumstances it will develop all its good qualities as a sail. It is not impossible, of course, at the present day, to make a photograph under *any* conditions, but for moving objects or a restless landscape, you need an instantaneous shutter and very fast plates. Unless the beginner is lacking in sources of worryment and courts trouble, he had best leave fast photography alone until he can make a good picture in the old-fashioned slow way.

Indoor photography is full of attraction and amusement, and can generally be followed with less inconvenience than when working out of doors. The matter of *lighting* offers the greatest difficulty under ordinary conditions, and the careful preparation of surroundings necessary to secure good results has often a tendency to discourage the amateur until he has become accustomed to the easier conditions out-of-doors. If his interest in photography is strong he will not be able to resist the desire to make some experiments in this line, and they will add to his stock of knowledge. Exposures by *flash light* have helped to the solution of indoor lighting, but flash light pictures are rarely artistic, and have added but a small share of beautiful results to the art. There is a branch of in-door photography, both fascinating and simple, which we should mention here, and that is the copying of engravings, paintings, etc. The main requirement is *an even lighting* of the print or picture, *shadows* or *reflected light* on the surface destroying the effect of the negative. If this is not looked after the negative will have areas of light and dark corresponding to the inequalities of the illumination, and the work will be ruined.

As a rapid exposure is not essential, the lens may be stopped down with the smallest

diaphragm to secure sharp definition, and a correspondingly long exposure given to compensate for the lessened illumination. The camera and the print to be copied must be arranged so that they are *absolutely parallel*, and *no chance* must be allowed for the least *vibration* of either, otherwise the negative will be spoiled.

For this kind of work the best plate, beyond question—and especially if the subject be in color—is Cramer's Slow Isochromatic, as it yields the full *color values* of the original. As this plate is extremely sensitive to light, care in the development is more than necessary.

## SECTION II.



### THE DEVELOPMENT.



OR a time the scene changes from sunshine to darkness, the next stage of the work being carried on in the dark-room.

When we speak of a dark-room, it does not follow, by any means, that one must have a room devoted solely to that purpose, although if you can obtain such a room, or adapt a small room to the work, it will add to your convenience and comfort. One of the present writers has made hundreds of negatives, and dabbled in all sorts of photographic work, but he has never attained to the dignity of such an absolute sanctum. Generally an ordinary kitchen has answered the purpose, chosen because it gave command of running water and sink facilities. Any room which has running water, and which can be made absolutely dark, will answer to the general needs. But the feature of absolute and uncompromising *darkness* must be insisted on. Light coming under doors, through blinds or

shades, cracks or crevices, will always endanger the work. If you will remain in the room, as we have noted before, for fifteen or twenty minutes after it has been darkened, or after you *think* it has been darkened, you will be surprised at the number of unknown and unthought of sources of light, sly shafts of it finding a way into the room in ways unperceived during the first few minutes of occupancy. While this test is not empirical, it is at least a fairly safe one for all ordinary usage. The developing light, the orange-red light from either the lamp or from a prepared window panel, must be the next thing to make sure of. This can be accomplished by putting a fresh plate into one of your holders, performing the operation in the dark-room with the orange light entirely excluded—in the tested and perfect darkness. Close the slide of the holder and light the orange ruby light. Then draw the slide of the plate-holder *half way out*, exposing one half of the plate and keeping it as far away from the orange light as you ordinarily would in developing and for a time equal to the number of minutes which would be spent in developing—which may be assumed to be about ten minutes. When that time has elapsed close the slide entirely and immediately shut out all the non-actinic or orange light and

proceed to develop the plate in the absolute darkness of the room. When *developed and fixed* the plate should show *all clear glass*, with no trace of anything upon it except the slight coating of gelatine, almost transparent, and with no apparent difference in any part of it. This would indicate that the light was safe. If it is *not* safe the plate will show a plain line of demarcation, and one half of it (the half exposed to the orange light) will be tinged with more or less of grey, while the unexposed half will show clear glass. This test will at once settle the reliable or unreliable character of your developing light. It is to be noted, however, that the test ought to be made with a *fairly fast plate*, such as Cramer's *Crown*, or Carbutt's *Special* or Seeds *26x*, for the slower plate could deceive you into believing the light satisfactory for *all* plates, when it might only be fit for slow plates.

The darkness and lamp quality assured, the orange-red light can be arranged and work commenced. Before the white light is excluded you should make sure that everything which you may need is in the room, that it is in a handy place, and that you will be able to find it under the new conditions. The plate-holders ought to be placed on a table or shelf a little way from the light and water splash-

ing, while the developing trays, chemicals, graduates and fixing-bath ought to be handy to the water. Don't put anything in the sink; you will want to have the running water, and you can never be sure that something will not get into the trays which has no business there.

The three trays are placed conveniently, the first one rinsed out with water and drained, the second filled with clean, cool water, and the third filled three-quarters full with the hypo or fixing solution. The bottle of *Bromide of Potassium* or restrainer ought to be in a position where you can instantly lay your hand on it. Have your mixed developer in the graduate, and a clean towel handy, so that you can always rinse and dry your hands before you touch the plates in the plate-holders.

With the few accessories thus disposed in orderly fashion, the developing light placed about a foot from the trays, and the white light shut out, open one of the plate-holders, and take out a plate; don't take them all out, but only as you need them for development. Handle the plate by the edges, and place face upward in the tray. It is a good idea to dampen the tray with water and drain, so that the developer will flow freely when poured in, and for a similar reason, the plate may be rinsed under the cool, clear,

running water for an instant, since it is necessary for the developer to flow freely over the entire plate at one clean sweep, and the surface of the plate, when dry, sometimes refuses to take it promptly. In such instances, one part of the plate, if fully exposed, may commence to respond to the action of the developing fluid before the part which the developer has skipped gets its return flow of the fluid. Never, under any circumstances, pour or allow the water or developer to flow directly *down* on the *surface* of the plate; always let it come in contact with the plate with a sideways flow.

The plate in the pan, pour the developer with one clean, easy sweep over the surface of it, and then keep up a gentle motion, causing the developer to flow backward and forward over the surface. If this latter point is not attended to, the plate will be marked by irregular stains and streaks, which will ruin it. (A simple way to rock the tray is to place a small stick, such as a lead pencil, under its center, and "see-saw" on it.) Keep up this gentle motion, and have your eye on the creamy white rectangle in the tray. An interval of time will elapse, and from the whiteness a tint of grey will show itself here and there, darkening steadily, if the exposure is near right, at some points

darker, at others lighter. The whole expression of the plate in the pan changes, and in a little while the plate seems to fade away against the grey black bottom of the tray. If this action is very rapid, if the dark tones flash all over the plate at once, pour the developer from the tray back into the graduate, taking care that the plate does not slip during the operation. Add to the solution in the glass a small quantity of Bromide of Potassium (restrainer), and pour back over the plate in the same fashion as at first. The over-prompt greyness has shown that the image thrown by the lens rested upon the plate too long, and the result to be avoided in this contingency is *flatness* in the negative. The sky and all white objects ought to be blackest on the plate, but with what is called a flat negative, these parts are too much of one tone with the rest of it, instead of preserving their independent values. The restrainer or retarder checks the over-quick action of the developer, giving those sections of the plate which have had the most light, and therefore ought to be darkest, a chance to get ahead of the other parts, and retain their proper balance.

With a normal exposure the development is comparatively simple, and a few trials will teach you how to avoid the grosser errors.

The nice use of judgment comes into play for under and over-exposed plates, and these seem to constitute the bulk of the results. For this reason a little time spent on the subject will not be amiss. In the opinion of the authors, the developer giving the softest negatives, and those richest in detail, with under-exposed plates, is Pyro. In the hands of others, and exceptionally in ours, other developers have produced fine negatives from extremely short exposures, but the results obtained with Pyro are so uniform, and the management of the developer so extremely simple, that we have learned to rely on it. The principal objections to its use are the necessity of always making fresh solutions from the dry salt, the liability to stain, and the imperative demand for continuous rocking of the developing tray. But these disadvantages in the Pyro developer are more than compensated for by the resulting negatives, so beautiful, so fine in printing quality. To illustrate, suppose we have a plate which we presume, or know, to be under-exposed. We take first the Alkali solution (carb. soda and water), and soak the plate in this for five minutes, then pouring it off and immediately flooding the plate with either No. 3 or No. 4 developer (as given in Part I.), and covering the tray with a piece of card-

board to exclude atmosphere and light, proceed to rock the tray, and keep this up for several minutes. The plate is then lifted and examined by holding it in front of the dark lantern and looking through it. If the development has started, the plate is replaced in the tray, and the rocking resumed, with occasional examination, until all the detail has come out on the plate, and it seems quite dense by the transmitted light. (Pyro requires denser development than some other developers.) In using the Pyro-Ammonia developer, it must be poured off the plate, and *fresh solution* substituted every 20 minutes. If after 40 minutes' rocking no detail appears in shadows (the "shadows" of a plate are its clear parts), the plate is probably worthless, but it may now be removed and placed *without rinsing* in a dish of pure water and, well covered up, allowed to soak for, say an hour, to coax out all detail. By this method many plates, otherwise worthless, may result in good negatives, but if after this treatment the plate still lacks detail, it had best be discarded as hopeless. It would be absurd, of course, to expend so much time on a negative unless for some reason it is very valuable, or impossible to replace. Five to ten minutes' rocking in the tray is enough for ordinary plates. With the No. 3 developer

it is not necessary to mix fresh *during* development, but you must always commence with fresh (and this applies to all Pyro developers). Soaking a plate in clear water for a time will always result in obtaining the fullest amount of detail possible, and if the tray is covered up and well protected from the light no injury to the plate can result.

Over-exposed plates work best with strong old developers and plenty of bromide, to give contrast and avoid flatness. With the Metol and Rodinal developers the older they become the clearer and harsher the results and the greater the contrast, so that old solutions should always be kept on hand for over-exposures.

With normal exposures the development is continued until by transmitted light (looking *through* the negative) the plate is quite dense, and the image shows with more or less distinctness on the back. The density required, however, differs in different makes of plates, as some fix out more than others, and for this part of the work experience is the only guide. Too often the beginner (and others as well) is prone to mistake an under-exposed plate for an over-exposed, and vice-versa. To avoid floundering in error, it is well to bear these facts in mind: *Under-exposed* plates are brilliant, clean, clear, and full of contrast—

they are *black and white* negatives ; the light acting on different parts of the plate, even for a very short time, causes the developer to give a strong, black film, but where *long continued* action of the light occurs it does not, as many suppose, give greater blackness to the film, but makes the image thin, brown and transparent. It is for this reason that an *over-exposed* plate is rich in detail, has no contrast (clear glass) and is not black but grey, while if held to the light it is very transparent. To get these facts well in mind a few experiments will aid you perceptibly.

To resume the development of our plate. As the image of this "something" on it, which you will soon learn to know and distinguish part for part, becomes more lost in the universal darkness which spreads over the film, you may pick it out of the tray and look through it, holding it by the edges before the orange light. Then you may judge it in the way that has just been mentioned above, and decide as to how far the action of the developer has gone. It is not safe to regard the appearance of the *back* of the plate as an index of its condition unless you know something of the kind of plate you are using. With some makes the image appears on the back in greyish white and remains so ; with others the image must disappear and the back

of the plate become wholly of the black tone before development is completed. Examination by the transmitted light is the only safe rule, and if the action of the developer is not accomplished, the plate must be put back in the tray and the rocking continued.

When your knowledge, gained by the suggestions given, reasons that the plate has had enough fellowship with the developer, raise it by the edges and let it drain into the tray. The next tray, it will be remembered, holds clean, cool water. We place the negative face up in it and allow it to remain a couple of minutes, then drain the water from the tray and cover the plate with fresh water. This operation ought to be repeated three or four times, and when you are sure of handling the plate by the edges skillfully, you may wash it under the running cold water, allowing the water to flow *over* it slantwise and not directly down *on* it.

After this washing or soaking, the plate is placed face upward in the third or fixing tray, containing the solution of Hyposulphite of Soda. Just before putting it there, hold it in front of the orange light.

You will notice that it is still opaque in the lighter sections and that the dark parts are very opaque. Put it in the fixing-bath, and as your fingers will probably come in contact

with the soda, wash your hands thoroughly and dry them before touching anything else. Now you may take the second plate from its holder and go on with the development of it, while the first one is resting in the fixing-bath; but as it is your first plate, we would advise you to wait for about 10 minutes and see the developed negative before attempting more. After the lapse of this time lift the plate from the tray, always by the edges, and look at it in front of the developing light. A surprising change ought to have taken place: all of the grey-white should have vanished and the plate show the negative picture in all its varied ranges of grey and grey-black, a certain element of light and brightness having appeared. Here, in black and white—or *light*—is the negative image of the scene you pointed your camera at, only, as it is a negative image, everything is reversed. The brilliant light of the sky is black, and the dark green of the trees, the grey of the rocks or earth are of a lighter hue, while the whole image is reversed, right hand for left hand as it really appeared. If you had taken the plate, as you may freely do *now*, out into the white light before the fixing solution acted upon it, it would have darkened all over in a few minutes; but now the developer has brought out the picture by its action, the sil-

ver salts, decomposed in proportion to the strength of light which fell upon the plate, have become grey or black, and the Hypo solution has permanently fixed and held this record by dissolving away all the free silver on the sections which the light did not strike.

A thorough washing in clear, clean, cool water will complete the work.

Thorough washing must not suggest the wash-tub or soap and water, but only water, and plenty of it, the washing being accomplished by frequent changes of water, or best of all, in running water, the stream being of just sufficient volume to change the whole body of the water every few minutes, and the washing kept up for about two hours. If the plate is then sponged off with a tuft of *absorbent* cotton, which must be *wet* before being used, it may be placed in the drying rack, which allows the moisture to drain all to one corner and the plate to dry evenly over its surface. If a negative crystallizes on the film surface after drying, it is an evidence that the Hypo has not been entirely eliminated, and shows that your washing is somewhere at fault.

When the negative is dry, and you come to examine it in the white light of day, you can criticize it to your best ability, noting a few more points about plates.

A FOGGED plate is thin and flat, and the image is lost, as a ship is, in the haze of the fog. The cause of fog is either that the plate has been *light-struck* in handling (that is, white light has met it before developing); or the developer has been too strong in alkali; or there has been lack of bromide; or over-exposure; or the developer has been too warm.

A WEAK NEGATIVE with *clear shadows* is caused by *under-development*, and it looks very much like an *under-exposed* plate, except that the high lights are not *black*, but weak.

WEAK DEVELOPER, *too weak*, will give a negative full of detail, but weak and lacking in *contrasts* and *snap*.

A negative TOO DENSE means *over-development*, the developer being too strong or too warm.

A WEAK negative and a STRONG negative may be treated to change their quality after fixing.

INTENSIFICATION, or strengthening a weak negative, is entirely safe, and will not cause a negative to fade if properly done. To intensify proceed as follows: Wash the negative for not less than two hours to eliminate the Hypo—*every trace of it*—and then immerse in a saturated stock solution of

#### BI-CHLORIDE OF MERCURY.

(*This chemical is given a line of full capitals*

*because it is one of the most violent poisons known, and must be handled with extreme care.)*

Allow the negative to remain in this until it is bleached (or turned white), and then remove from this bath and place in a solution composed of

Ammonium Chloride . . . . .	1 ounce
Water . . . . .	10 ounces

Allow the plate to soak for five minutes (rocking the tray), and then wash in running water for 10 minutes. Then place in a bath of water to which a few drops of strong ammonia have been added. In this bath it will blacken all over. Remove and wash in running water for 10 to 15 minutes, and dry. If found *too intense* it may be reduced by immersion in a weak Hypo bath and then washed for not less than one hour.

REDUCTION, or reducing the density of a negative, is accomplished as follows: Make a solution of Red Prussiate of Potash, one ounce of it to 15 ounces of water, and mark this "Stock Solution," and note that it also is a *strong poison*.

To reduce, take a fresh Hypo bath and add to it a few drops of this solution, immersing the negative in it. (The more potash, the more rapid the reduction.) Watch the plate carefully, and when sufficiently reduced, rinse in clear water to stop the process, and then

examine. If the negative is now satisfactory, wash for one hour to eliminate the Hypo. If certain local spots require further reduction, take a mop of absorbent cotton and dip in the potash solution and rub on the dense spot, examining constantly until right, and then wash. This work may all be done in daylight or white light, and experience with the procedure will save many a plate from ruin, and assist in producing a negative which can be printed from with greater readiness.

The quality in development which leads on to success is, first and markedly, cleanliness. The chemicals must be mixed with care, the bottles, trays and graduates well washed, and everything kept separate. The fixing solution must not mingle with the developer or come in contact with it, and it was with this in view that you were directed to wash and dry your hands after the fingers had immersed the plate in the Hypo. A little thoughtlessness in these matters often produces a surprising amount of trouble, and the worst of it is that the beginner, under these circumstances, cannot tell where to look for the cause. By avoiding "every appearance of evil," you have at least one source of assurance, and when anything goes wrong you can trace it the more easily. Of course, the experienced workman allows himself a degree of license, and may do

things which the beginner ought not to allow. In the dark-room so much is dependent on mere sense of locality that the freedom of work done in daylight cannot be permitted.

The plate-holders, while in the dark-room, must be kept away from the solutions and the water ; there is always a chance of them being splashed with a solution, and fresh plates put in the holder in ignorance of the trap. The holders are meant only to contain clean, fresh plates, and they must therefore be guarded. Before filling them with new plates the record tablets should be cleaned by rubbing with a damp cloth, the record having been copied if desired, and a number given to each plate, small gummed labels, just large enough to fasten to the unused margin of the plate, being furnished by the stores ready to attach when the corresponding plate is taken from the rack. After every use of the holders it is wise to dust them out with a soft brush before re-filling.

The plates in the rack will take a few hours to dry, depending largely on the state of the weather, for in damp, muggy weather the drying of the film takes place slowly. Until they are perfectly dry they must be let alone, although as you go further on in photographic work you will learn methods of speeding the drying in special emergencies.

The six plates in the three holders, if all have been used, may be completed in an evening, the procedure in the case of each one following in regular order. But for the beginner, unless unusually apt or accustomed to chemical work, this amount of labor will be unwise to commence with, for haste makes waste in photography, as in many other things.

After your developing work is finished the trays, etc., must be washed clean with running water. Never use soap or any cleansing agent on your dark-room appliances, since a fraction of the alkali in the soap, left on a tray or graduate, *may* make discord, and all of the chemicals you use are readily soluble in water, so that rinsing thoroughly with that fluid gives all the cleansing results you need.

When from any cause a plate is slow to develop, keep even the safe light away from it, and only bring the tray before the light as occasion requires your looking at it. With the quicker variety of plates beyond No. 25 sensitometer, as marked on the package, it is wisest to have a clean piece of cardboard large enough to entirely cover and lap over the edges of the tray while waiting for the developer to act. It not only keeps out the light, but in a warm room, it also prevents the heated air from acting, as it will, as an accelerator in the effect of the developer.

A moderate coolness is essential to good development. Warm solutions, or an over-warm room causing them, do more than chemical damage, since they may bring about an organic change in the gelatine film of the plate and soften it so that it will pucker or try to leave the glass at the edges. In practice this is called *frilling*, and has often ruined a valuable negative. As it is only caused, with good plates, by too strong developer, or heat in the dark room, or transferring the plate directly from the developer to the Hypo without washing, it can be entirely avoided by using precaution. In the dog-days of summer ice water and ice in the developer and Hypo solution may be necessary.

And, to conclude this chapter, OVER-CARE is a symptom of danger. It leads to nervousness, and a being wants a cool head in a dark-room ! There is a line of finicky handling of everything you work with which simply makes your pursuit *a bore and a nerve-eater*. Take it to your heart that thousands of negatives as precious as yours have gone under before your time, and there is no very great gap in the world after all !

### SECTION III.



## THE PRINTING.

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HERE is a popular impression that the immediate result of "taking a picture" is a finished photograph in the camera, and the uninitiated will express surprise at your inability to answer their many inquiries: "Did you get it?" "Is it a good one?" "Let me see it?" The negative will always be a mystery to the unenlightened; it is an unreal affair, so different from the ordinary conception, and so little understood.

In photography, the negative is what the type is in printing, and "sun" impressions can be struck from it in large quantities, just as the types print themselves upon the sheets of paper. It might be said to be an electrotype of certain impressions of nature, capable of yielding many prints.

In printing a photograph, various substances—usually paper—coated with a light-sensitive chemical film, are used to receive the impression from the negative, the light

action being similar to that in the production of the negative. The light passing through the thin parts of the negative blackens or discolors the paper, while the denser parts hold back the light. As the opacity of the negative varies in different parts, according to the light-values received, so the paper will show gradations of tone and color corresponding to the amount of light transmitted by the negative. Therefore, the thin parts of the negative, which represent the shadows in the view, allow a large amount of light to pass through and make a strong impression on the paper, while the high-lights or bright parts of the view are black and opaque in the negative, holding back the light and making but little impression.

The sensitive papers on which the prints are made are of many varieties. The use of the negative and the action of the light is the same in all of them, the only variation being in the way the print appears on the paper, or the way it is brought out or fixed there, and the amount of light required for its production. We shall restrict ourselves to the principal varieties, which include

Silver Papers.	{	Plain Salted Paper.
		Albumenized "
		Bromide "
		Aristotype "
Platinum Paper.	{	The Platinotype.

Iron Papers.	{ Ferro-Prussiate, or Blue-Print Paper.
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We will first describe, in broad terms, each of these processes, and follow later with more detailed instructions for their use, giving the necessary manipulation for each.

**THE PLAIN SALTED PAPER** is the oldest of this group, and, while not popular with the professional photographer at the present time, it is a very beautiful and artistic process, and deserving of careful attention at the hands of the Amateur Photographer, as he is not restricted in his work by the demands of a sometimes vulgar public. This process gives black and brown prints, devoid of gloss or luster, resembling in its fine effects the richest engravings. Plain, chemically pure photographic paper, saturated with a solution of Ammonium Chloride, is sensitized with Nitrate of Silver, the two chemicals uniting in the substance of the paper to form the light-sensitive Silver Chloride.

**ALBUMENIZED PAPER** is similar to the Salted Paper, except that instead of being "salted" with a solution of Ammonium Chloride in *water*, the surface of the paper is covered with a coating of Albumen or white of egg, in which the salt has been thoroughly incorporated. This paper is also sensitized by contact with a Nitrate of Silver bath, but here the silver com-

bines not only with the salt to form a silver chloride, but also with the albumen to form an organic albuminate of silver, which is itself light-sensitive, and assists in the production of the picture. The sensitive film being on the surface of the paper, and having a transparent depth, gives to the picture a depth and brilliancy impossible with the plain Salted Paper. Albumen Paper gives black, brown and sepia tones.

ARISTOTYPE PAPERS are similar to the Albumen Paper, except that they are coated with an *emulsion* of Silver Chloride in either Gelatine or Collodion. The Silver Chloride in this case being formed in the emulsion first, and the paper then coated with the sensitive emulsion, while in the "Salted" and "Albumen" paper a double coating is necessary, the paper being treated first with the Salting Solution and then with the Silver Solution, the Silver Chloride being formed in the film during the second coating. The Aristotype Papers claim superiority because of their extremely high gloss, their long-keeping qualities before use, and that they may be bought ready prepared for the printing-frame. These advantages are offset in the opinion of many by the lack of artistic effect, due to the high gloss, and the harsh, chalky tones as compared with Albumen Papers.

THE BROMIDE PAPERS differ from the other Silver Papers in their sensitiveness to light, the black and sepia tones obtained, and the methods of developing, the picture not being visible during the process of printing. In this class of papers the light action is produced by employing a Bromide of Silver and not a Chloride. In these features they resemble the dry-plate, and, in fact, the chemicals and chemical action obtained is the same as in the production of the negative, the sensitive emulsion being spread upon paper instead of glass.

PLATINUM PRINTS are made, as the name implies, with the Salts of Platinum in place of Silver. The softness of these prints goes beyond the finest photogravures, and they are probably the most beautiful of all photographic reproductions. The prints have no gloss, and the tones vary from a beautiful gray to a rich, velvety black.

BLUE PRINTS are made on paper coated with an Iron Solution. They are extremely beautiful if properly made, and possess great artistic merit, the bad repute into which they at one time fell being due to improper coating of the paper and careless manipulation on the part of the operator. Apparently the easiest to handle of all photographic papers, every tyro in the art of printing felt

himself to be above instruction, and licensed to the most careless and slovenly manipulation. Feeling himself a past master in the art of blue printing, the paper was invariably blamed for every defect, and any suggestion that the negative or the operator was at fault met with the universal comment, "Do you suppose I don't know how to make a blue print?" Well, usually he didn't! This paper renders faithfully every gradation of the negative, and is remarkably rich in soft and delicate definition, the color of the print being a rich Prussian blue with beautiful china-white high-lights.

Before describing the work of printing a photograph, we will say a word regarding the apparatus, and refer to some of the operations and the reasons for performing them.

THE PRINTING-ROOM should have a southern exposure, and from the window of the room should project a shelf for holding the printing frames. This shelf ought to be provided with supports for holding the frames at such an angle that the light can fall in parallel rays on the negative, so that the edge of the frame may cast no shadow on the picture. Blocks of wood against which the frames may lean will answer the purpose. The window may have a curtain, or the room be divided off, to enable the operator to load and unload his frames

and examine his prints in subdued light. Running water is an absolute necessity, if any amount of work is to be done and good results desired. A keg with a faucet and a lined box for a sink will answer, where running water is unobtainable. Empty dry-plate boxes or similar receptacles are useful for holding the sheets of paper before and after exposure. The printing-room should be supplied with tables and shelving for bottles, chemicals and apparatus. Four trays are necessary; those of hard rubber are best. One for "silvering," one for washing the prints, another for "fixing," and a fourth for the final washing. *The tray for silvering* should be at least 10 x 12 inches in dimensions—the professional usually uses 20 x 24. The object is to silver as large a sheet as possible at one time and cut into smaller sizes when dry. Of course, the larger the tray the more bath must be used, and as the first expense in making up the silver bath is considerable, this must influence the amateur in the size selected. The "toning" may be done in the tray used for the first washing, and likewise the fixing and final washing of the prints may be carried on in the trays used for fixing and washing the negatives. It must be distinctly borne in mind that the trays used for silvering, preliminary washing, and toning must

never come in contact with the Hypo or fixing solutions, and prints, after being in the fixing solution, must not be placed in these trays. The same care should be used with the fingers in working with the prints. After the hands have been in the fixing solution or in the last wash water, they must be washed before again handling the silver or toning trays or solution.

A FUMING-CLOSET OR Box can, for the first experiment, be a very simple affair, and a suitable contrivance will readily suggest itself, but for a permanent fixture the following may be used, the dimensions varying according to the size and number of sheets you expect to handle. Take a tight box two inches wider inside than the narrowest measurement of your sheet of paper, and about eight inches higher than the longest way of the sheet, and to the front of the box hinge a door to open like a closet. Four inches from the real bottom have a false bottom, perforated with holes one-eighth inch in diameter and about one inch apart. One inch below the top, on the inside, tack to each side of the closet a strip to act as ledges on which to hang cross strips which hold the paper to be fumed. Now, after the paper is silvered and thoroughly dry, it may be fastened by pins to strips of wood, and these slats, with the paper hanging straight down from them, are slid in one after

the other on the ledges in the fuming-box. On the real bottom of the box a saucer filled with one or two ounces of the strongest Ammonia—not Aqua or Household Ammonia—is placed, and the door closed. The fumes arising will strike the perforated bottom and being thus evenly distributed will pass through to the upper section and come in contact with every part of the hanging sheets of paper. The use and need of the fuming-box will be described under its proper heading.

THE PRINTING-FRAME can be described easily by comparing it to a heavy picture frame with a ledge for holding the glass or negative, a perfectly flat and substantial wooden back which is in two sections, hinged together, and removable from the frame. Pivoted in the center of each section is a curved brass spring, which, when the back is in position, swings around and fastens under catches on the sides of the frame, thus holding the back in place and bringing pressure to bear on the negative. A felt pad is placed between the negative and back of frame to make the pressure more uniform and secure perfect contact between the negative and sensitive paper. We do not advise any amateur to make his own frames, as they are offered in great variety, at very low prices, by the various stock houses. When using one

frame for printing negatives of various sizes, a sheet of glass being first placed in the frame, the negative may be centered on this, but it is best to have different sizes of frames to correspond with the negatives, as the uneven surface of the glass and the additional pressure may cause the negatives to crack. The back of the frame is made in two sections, to allow of inspection of the paper during the process of printing, as one section, with the spring caught under the catches, holds the negative and paper from shifting while the other is raised.

A DAMPENING BOX is useful for moistening albumen and plain paper before it is silvered. If you attempt to float a dry sheet of paper on the silver bath it will curl up and be unmanageable, and the sheet will not absorb the silver evenly. To avoid this the paper is slightly dampened before silvering, but as this cannot be done by *wetting* the paper, which would spoil its surface, it is accomplished by keeping it for 24 hours in a moist atmosphere. The box is made as follows: Take a tight box three inches larger in width and length than your paper, and six inches deep. Tack a strip to each of its long sides two inches from the top on the inside; make a lid with lips to come down over the outside of the box and act as a cover; secure

bottom and top well with battens to prevent warping, or line the box with painted tin. Across the strips mentioned lay slats about two or three inches apart. In using the box, place two clean blotters, chemically pure, on the bottom, and on these lay the albumen or plain salted paper, placing on top of it two more blotters. Four to six blotters, which have been thoroughly saturated with water, but are not dripping, are to be laid on the slats and the lid of the box put on. The paper will be found nice and limp when needed for silvering, but it must not be kept in the box many days, or it will mildew.

THE SILVER BATH in its simplest form is made by dissolving chemically pure Nitrate of Silver in distilled water, the average strength being 50 grains to the ounce. The bath may vary within the limits of 30 and 80 grains of silver to the ounce of water. Some operators add other substances to the bath for various reasons, and with some special papers this has advantages, but for our purpose it is unnecessary, and we shall adhere to the simple formula here given :

Nitrate of Silver (C. P.) . . . . .	60 grains
Distilled Water . . . . .	1 ounce

Dissolve and keep in a glass stoppered bottle, *in bright daylight*. After using the silver bath a few times it will often be found to turn

red, and cause dirty brown streaks to appear on the paper. This is caused by the organic matter which is dissolved from the paper and carried into the bath, and when it is in this condition it is not fit for use. The object in keeping the bottle in bright light when not in use is that the albuminate and chloride of silver held in suspension may be acted on by the light and precipitated to the bottom; care, of course, must be used to filter out the precipitate before use. After a time, however, even this precaution will not be sufficient, and it will be necessary to *clear* the bath. A simple and very effective method is to add to each pint of silver solution an ounce, or more if necessary, of Kaolin—White China Clay—and shake up thoroughly and pour into a filter. If the first part runs through cloudy, pour this back into the funnel and refilter it until it comes through clear and sparkling. Of course, a clean bottle must be used. When filtered, the bath is again ready for use. After repeated use fresh Nitrate of Silver should be added to keep the bath up to strength, as every sheet of paper floated robs the solution of some of its silver. A lump of Silver Carbonate, kept in the bottom of the bath, preserves its neutrality. The free nitric acid in the used bath combines with the Silver Carbonate to form fresh Silver Nitrate.

THE TONING-BATH for the Salted, Albumen and Aristo papers is a solution of Chloride of Gold and other chemicals, to be mentioned in each formula, in water. It is a well-known fact that if a print on any of the above papers be "fixed" without any intermediate process, it will have a disagreeable red tone, and lack all of the beautiful qualities we are accustomed to expect in a photograph. The necessary intermediate process is that of *toning*, in which a layer of Gold is deposited on the image of silver formed during the printing. The print may be said to be "plated" with Gold. The object of adding other chemicals to the bath is to bring about an alkaline reaction and regulate the "speed" of the bath. The tone of the print depends on the rapidity with which the deposit of Gold takes place. If the action be slow and the Gold deposited in very fine crystals, the resulting image will have a ruby color, while a rapid action causes the Gold to precipitate in larger crystals and produces a blue or purplish color. The Chloride of Gold is best purchased in tubes containing 15 grains each, and the contents of this tube immediately added to 15 ounces of distilled water contained in a glass stoppered bottle. This makes it more convenient for measuring, as each ounce of water

will represent, approximately, one grain of Gold.

With these preliminary remarks, we will leave the subject, to resume it again when treating of the operation of toning, at which time a few formulæ will be given.

THE FIXING-BATH is made by dissolving one ounce of Hyposulphite of Soda in six ounces of ordinary water. This solution decomposes readily, and should be mixed fresh for each day's work, and not used over again. Remember that all vessels used for holding the fixing solution must not be used for anything else.

For our first experiments in printing we will begin, as did the "Fathers of Photography," with

**SALTED PAPER:** Obtain from your stock house a few sheets of the Rives Plain Photographic Paper, having a smooth surface and measuring 18 x 22 inches. Examine the two sides of the sheet carefully, and you will see that one is smooth and possessed of a beautiful finish, while the other is very slightly "pitted" as if it had lain while moist on a fine wire cloth. The smooth side is the right side to coat. Mark this so that you will know it at a glance. Place this paper in your dampening box for 24 hours; when ready for use, prepare a sufficient quantity of the

following salting solution to well fill your tray:

Ammonium Chloride (pure) . . . . 8 grains  
Distilled Water . . . . . 1 ounce

After pouring this solution into your tray, take a strip of clean paper and skim the top, to remove all dust and dirt. Now lift a sheet of paper from your dampening box and, taking it by two diagonal corners, bring the hands close together; holding the sheet over the tray, allow one of the free corners to touch the solution, gradually lowering the sheet, spreading the hands apart as you do so, until its whole surface is in contact with, and floating on, the bath. If it shows a tendency to curl up, breathe slightly on it—do not blow—and the moisture of the breath will cause it to uncurl and lie flat; if it curls badly it has not been dampened properly, and needs a longer time in the dampening box. Now, supposing the sheet to be resting on the solution, lift it carefully, first by one corner, inspecting the under surface to see that no air-bells are formed; after looking at this, try the other corners, till you get a view of the whole sheet. If any air-bells are present, break them with a glass rod or stick kept for that purpose, and allow the sheet to again rest on the solution. If the air-bells are not broken, the paper will absorb no solution in

these places, and they will show as white spots in the photograph. After the paper has remained in contact with the solution for three minutes, it is raised by taking hold of one corner of the sheet, and slowly and steadily lifted until another corner is free, when this is also grasped, and the whole sheet raised with a slow, uninterrupted motion; it is then hung by clips on a line to dry, the end leaving the solution last being always kept the lower, while a strip of blotting paper attached to the lower end absorbs the moisture draining to the bottom, and assists in uniform drying. Follow with another sheet, and so on, till all are salted. After the paper is thoroughly dry it may be stored away until needed, as it keeps perfectly.

These manipulations have been given with considerable detail, and as they apply as well to the silvering of the paper, it will not be necessary to repeat them fully. The Salting of the paper may also be accomplished by *immersing* it in the solution, one sheet after another, avoiding air bells, and allowing six or eight sheets to lie in the solution for five to ten minutes. This is more apt to spoil the surface of the paper, however, and is not as instructive, as practice in salting is valuable experience in silvering, which must of necessity be done by floating and not by im-

mersion. Those who prefer to buy their paper ready salted will find a brand on the market, under the name of "Clemons Plain Salted Paper," which is thoroughly reliable, Mr. John R. Clemons, the manufacturer, being one of the pioneers in photography. Many advise the addition of gelatine to the salting solution, but the writers can say from experience that unless it is present in large quantities it is valueless, and if present in quantity the amateur will find it impossible to salt evenly, as the solution collects in "tears" while drying, and to coat perfectly with this heavy solution a special machine is necessary; therefore we confidently advise the simple formula given.

Having salted and dried our paper, we place it in the dampening box preparatory to silvering. When ready, we prepare our silver bath as already given, and, pouring the solution into the silvering tray, which has been placed in the dark-room, or a room lighted by artificial light, we skim off the surface to remove dust and dirt, and prepare

TO SILVER THE PAPER. Taking the sheets one at a time from the dampening box, we float each in turn on the silver bath as described in "Salting," being careful, of course, to have the right side or salted surface in contact with the solution. Examine carefully for

air-bells, and allow the sheet to float for about two minutes ; then lift it slowly and steadily, and fasten on a line to dry, as previously described. The room in which the sheets are hung must be free from all daylight, and warm and dry, to hasten drying. If the room is damp and the drying unduly prolonged, the prints will be flat and lacking in brilliancy, as the solution will sink into the paper. The amateur will find it convenient to silver his paper in the evening, and, after thorough drying, put it away for use the following day, but it does not keep well more than one or two days. It is preserved best under pressure in a printing-frame, with a sheet of *dry* blotter on each side of the package. Of course, to keep it in a frame it is necessary to cut the sheets to the small sizes ; the only drawback to this is the extra trouble of fuming small pieces instead of the large sheets, but this is not a serious obstacle. The paper must be fumed *just before printing*, as it turns yellow and spoils rapidly after fuming. Having prepared our paper and dried it thoroughly, we place it in the *fuming box* for 15 minutes and fume with strong Ammonia. This is done because an acid reaction in the paper interferes with the printing and toning. Fuming counteracts any acidity, and gives to the paper a certain degree of mois-

ture. In printing the image, the light acts on the Silver Chloride and reduces it to the Sub-Chloride, at the same time liberating Chlorine. If the Chlorine thus liberated has no chemical with which it can combine, it attacks the print and causes it to darken in spots. But when the paper has been fumed with Ammonia the liberated Chlorine combines with the Ammonia to form Ammonium Chloride, a harmless product. The paper is removed from the fuming box, and, still carefully guarded from light, is cut to the required size. The small sheets are now placed in a dry-plate box or any suitable receptacle, and carried to the printing room. Selecting our negative, we dust it off carefully and place it in the printing-frame with the *film* side *upward* or *inward* in the frame; on this lay a sheet of the plain silver paper, placing the coated or sensitive side in contact with the film of the negative; on the paper a felt pad or sheet of blotting or soft paper, and over all lay the back and fasten firmly in place. Now turn the frame over, see that no dust is on the surface of the glass, and that the paper is not creased or folded, and put it on the printing shelf, resting against a block so that the surface of the negative receives the light in direct rays, to avoid casting shadows on the paper from the raised edge of the frame.

Whether we put the frame in direct sunlight or bright diffused light will depend on the quality of our negative. If the negative is very thin or of moderate density, it is best to have it looking away from the sun toward the clear sky, as it will print more slowly and evenly, but dense negatives had best be printed in direct sunlight. Having allowed the picture to print a few minutes, we take up the frame and, stepping back from the window into the subdued light, unfasten one spring, and, raising that end of the back board, lift the paper and inspect the print. If all has gone well, the picture will stand out clearly and distinctly in beautiful bluish-black colors, but it is necessary to carry the printing process beyond what would seem right, as subsequent operations tend to reduce the intensity of the print. No definite rule can be given for printing, as every negative is a law unto itself, but in a general way, Salted Paper should be printed until the shadows are very dark, the fine detail begins to be lost and the *high-lights lose their white color, becoming slightly tinted*. The latitude to be allowed in this and all the processes must be learned by experience, as it cannot be described in words.

Our print, being judged sufficiently strong, is removed from the frame, and, carefully

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guarded from light, is slipped into an old dry-plate box or some suitable receptacle until all the negatives for the day have been printed. If on inspecting the print we find that one part of it has printed too dark and other parts not enough, we must "doctor" the negative so that the thin parts can be held back, and print more slowly. This is done with tissue paper usually, or it may be accomplished by "reducing" the dense part of the negative, as described in another chapter of the book. Or again, if only one section, as a corner, is too thin, it can be shaded by holding a piece of paper or card board above the frame to cast a shadow on the thin portion, moving the card board constantly, so that no sharp line of shadow will show on the print. If the tissue paper is used, the following is a simple method: Moisten a piece of tissue or tracing paper, and paste it to the glass side of the negative; hold it up to the light, and with a pencil trace out the *parts which print too dark*, then with a sharp knife cut away the balance. This will be apt to show a distinct line if printed in a bright light; to avoid it, place a second piece of tissue paper over the front of the frame, so that it stands away from the negative about a quarter of an inch, and this will produce a soft, diffused light. A little crayon or black lead may be rubbed into the

tissue which is pasted on the negative, if some parts still print too rapidly. It pays to "doctor" a good negative, but a poor one had best be thrown away, and another exposure made.

To return to our prints, which are ready for TONING. Take a clean tray, free from Hypo, and place in it a sufficient quantity of the following solution :

Citrate of Soda . . . . .	3 grains
Distilled Water . . . . .	1 ounce

Put the prints in this solution, one by one, seeing that no two stick together, and allow them to soak for fully five minutes, rocking the tray occasionally. Pour off this solution and discard it, as it will not answer for future use ; now wash the prints thoroughly by frequent changes of water for 20 minutes (which can be done in the same tray), and after all the free silver is eliminated, place the prints in the toning bath, which has been freshly prepared by the following formula :

Gold . . . . .	1 grain
Water . . . . .	24 ounces
Table Salt . . . . .	5 grains
Carbonate of Soda . . . . .	5 grains

The Gold is measured by taking one ounce of the "stock" solution of Gold previously mentioned. Test the alkalinity of the bath by placing in it a strip of *red litmus paper*, which it should turn *blue* ; if the paper is not

turned blue, add sufficient Carbonate of Soda to accomplish this. This bath does not keep, and must be prepared each time. The prints should be kept *face up* in the bath and the tray rocked by placing under it a stick or pencil and "see-sawing" it. Occasionally change the prints so that those on the bottom will come on top, and see that all are under the solution. The toning may be carried on by daylight or lamplight, but if in daylight, they must be handled in *subdued* light, say on the opposite side of the room from the window, and it is well to begin by toning but a few prints at a time, as it is awkward for the beginner to manage many at once. After an immersion of a few minutes the prints will be seen to change color to a sepia or else a purplish blue tone. To test the completion of the process, the prints are lifted from the bath from time to time and examined by transmitted light—by looking through them at the bright light. When the fine detail or delicate portions begin to show a *bluish* color, the process may be stopped by throwing the prints into a pan of clean, fresh water, if sepia or light brown tones are desired, but for blue-black tones, the process must be continued until the denser detail also shows blue by transmitted light. Red spots in the prints are caused by finger marks, the gold refusing to deposit

where the perspiration from the hands has left a greasy film; handling the prints with wet fingers will avoid this. As some prints tone more rapidly than others, each one must be removed from the bath and placed in a pan of water when it is considered right, and all not toned for the same length of time. Having placed all the prints in water, they are washed for five minutes, with two or three changes, and transferred to the

FIXING-BATH, which has been freshly prepared. In this they remain for 20 minutes, being frequently moved about, that the solution may come in contact with all. The fixing-bath consists of

Hyposulphite of Soda . . . . .	1 ounce
Water (ordinary) . . . . .	6 ounces

Be careful not to dabble your hands in the fixing-bath and then in any of the other solutions or trays, and keep the *fixing tray separate* from the others, both while in use and out of use. After fixing for the proper length of time, the prints are placed in clean running water and *washed thoroughly* for about three hours. It is also an advantage during the washing to place the prints one at a time on a glass slab and gently sponge both surfaces, then throwing them back in the wash water. When thoroughly washed, the prints are ready to dry; this may be done by hanging on a

line like a small "wash," or placing between blotters. The latter method is apt to cause trouble if the blotters are not chemically pure.

Prints on Plain Silver Paper, if made according to directions, afford fine opportunities for coloring, and if water color paper be used, the finished result can scarcely be told from a genuine water-color picture. For those possessing aptness in the coloring line, this is a fascinating branch of photography, as nothing enters into the coating of the paper which can in any way change the surface of it. The colors can be applied as easily as to plain water-color paper, making in the finished print an artistic effect hardly possible with the gelatine-coated Bromide Papers which are so often used for this work.

Some of the most artistic prints which the authors have ever made were printed on heavy rough surfaced water-color paper, the surface resembling canvas in its appearance. These prints are beautiful, whether colored or not, and are specially adapted to large, bold work. The paper may be purchased of any artists' material house, and is salted best by *immersion* in the salting bath, the sheet being first sponged with *distilled* water in place of using the dampening box.

After salting and drying, it is silvered by tacking it to a board and applying the silver

solution with the aid of a camel's hair brush three or four inches wide and bound in rubber. The paper is first stroked lengthwise and then across, the operator making sure that every part is thoroughly covered with the silver solution. If the paper refuses to take the silver, it may be dampened first. The "Three Crown" toning bath given under Albumen Paper Prints gives beautiful effects with this heavy paper, but it must be borne in mind that strong, vigorous negatives are better adapted to the plain salted papers than are weak ones. A silver bath for Salted Paper, giving good results without fuming, is made as follows :

Nitrate of Silver . . . . .	50 grains
Nitrate of Ammonium . . . . .	30 grains
Liquid Ammonia, strongest. . . . .	3 drops
Distilled Water . . . . .	1 ounce

This bath keeps well, and only requires filtering before use. With it the paper does not require fuming, and it works equally well with Salted or Albumen paper.

ALBUMEN PAPER. Very probably no photographic paper has been so popular and so universally used as Albumen. This beautiful paper certainly deserves the favor to which it has attained, and its successor has not, in the opinion of the authors, yet appeared. Albumen prints combine the artistic beauty of plain surface prints with the richness and

depth of glossy paper without any of the objectionable features of the latter class. The manipulation is simplicity itself, and if carried out with any judgment the results are uniformly satisfactory. The paper is handled much the same as plain salted paper, and is, if anything, easier to work.

Albumen paper is found on the market ready coated, the difficulties in albumenizing being such as to limit the manufacturing to a few large firms who have had an extensive experience covering many years. The coating of the paper consists of Albumen or white of eggs, in which is incorporated Ammonium Chloride. The Albumen is prepared by a special process, which makes a clear, limpid solution free from all the stringy, sticky properties so familiar to us as characteristic of white of egg. As stated in the beginning of this chapter, the image is formed, not alone of Silver Chloride, but Silver Albuminate as well, the Nitrate of Silver bath having a certain affinity for the Albumen as well as the Ammonium Chloride. This, together with the fact that the coating is on the surface of the paper and has an appreciable thickness, allows of deeper printing, which brings out all the detail in the dense shadows, making it clear and apparent in the transparent depth of the Albumen.

For our experiment we purchase from the stock house a dozen sheets of a standard brand of Albumen paper and place them in the dampening box for 24 hours. The sheets are then floated on the silver bath, already given, for two to three minutes, care being taken to have the surface of the bath clean and free from scum, the manipulation throughout being the same as with the salted paper, except that it is necessary to be very careful to avoid cracking or breaking the paper by rough handling, or spoiling the surface with moist fingers. Albumen paper and prints, when rolled for carrying, should always be rolled with the Albumen side *out*, as the film is less liable to break.

After silvering and drying, the sheets are fumed for 15 to 20 minutes, cut to size, and placed in a box and kept from light. Selecting our negative we expose as before, but the printing is not carried as far as with the plain salted paper, it being sufficient to print up clear and strong and carry a shade or two beyond what we want the finished print to be. If, after toning and fixing, the print is light and has a washed out, faded appearance, it has not been printed enough; if dark and heavy looking, the exposure has been too long. When the day's printing is finished, the prints are placed one by one in a pan of clean water

and while thoroughly protected from light they are washed for 20 minutes in several changes of water, the washing continued until the water runs off clear and loses its milky appearance. They are then ready for toning.

We have at our disposal many formulæ for toning baths, all possessing some peculiar advantage in the hands of those familiar with them. We give a few of the most popular. An excellent bath, and exceedingly simple withal, is that of Abney & Robinson :

FORMULA No. 1—

Chloride of Gold . . . . .	1 grain
Carbonate of Soda . . . . .	10 grains
Distilled Water . . . . .	10 ounces

It must be used immediately after mixing. This bath gives sepia and purplish brown tones, depending on the quality of the negative and the depth to which toning is carried.

FORMULA No. 2—

Acetate of Soda . . . . .	1 drachm
Gold . . . . .	5 grains
Distilled Water . . . . .	12 ounces

To get the best result from this bath, it must be at least a week old. With proper care it keeps indefinitely. The tones are purple or brown, according to the length of time the print is immersed.

## FORMULA NO. 3—THREE CROWN TONING BATH.

*Solution A.*

Powdered Borax . . . . .	150 grains
Double-fused Acetate of Soda . .	90 grains
Bi-Carbonate of Soda . . . . .	45 grains
Distilled Water . . . . .	1 quart

*Solution B.*

Chloride of Gold . . . . .	15 grains
Distilled Water . . . . .	2 ounces

Mix all of Solution A with one ounce of Solution B, and reserve the balance to strengthen the bath when exhausted. This bath keeps indefinitely, and only requires the addition of a little Gold (Solution B) as it loses strength. It must be filtered before use. All three baths here given are excellent, but No. 3 has given us greater satisfaction than any we have tried. The range of tones possible are very great, and if used in combination with the Three Crown brand of Albumen Paper, the prints work up beautifully, and sepia effects and delicate browns unknown on other papers are the result. In cold weather the toning bath should be about the temperature of the blood. The prints after washing are placed in one of the above baths and kept constantly moving, face up. They are examined from time to time by transmitted light, and for sepia tones are removed as soon as the delicate half-tones appear slightly blue. Dark brown and purplish black tones need

further toning, but if carried too far the prints after fixing will have a flat, faded, disagreeable color. As the toning is completed throw the prints into a pan of fresh water and wash thoroughly, when they may be transferred to the following fixing-bath. Double fixing, that is, passing through two fixing-baths will insure greater permanency to the prints :

Hyposulphite of Soda . . . . .	4 ounces
Water . . . . .	1 pint
Ammonia (strong) . . . . .	30 drops

The addition of the ammonia prevents the blistering of the film, so common with highly albuminous papers. After the prints remain in the fixing bath for 20 minutes, they are washed thoroughly in running water for not less than three hours, and it is again suggested, as in printing plain silver paper, that the prints be sponged off once or twice during the final washing. As albumen prints have an irresistible tendency to curl up while drying, and thus crack the surface, the authors dry them between blotters, but it is absolutely necessary to have chemically pure blotters—obtainable at photo stock houses—and use them for nothing else, being careful to discard them altogether when stained or soiled.

ARISTOTYPE PAPERS are very popular at this time with many amateurs, but the authors have little to say in their favor, except the good keeping qualities of the paper before

use, its convenience in being manufactured in all the photographic sizes, ready to use without any preparatory manipulation, and the great saving of time resulting therefrom. For these advantages it seems to us that artistic merit and permanency of results are sacrificed. We are not joined in that opinion, however, by many of the most prominent photographers, both professional and amateur, so the question must remain an open one for each to decide personally, and as all the many manufacturers send full directions for working each particular brand, it is not necessary to go into the operations here.

**BROMIDE PAPERS.** A comparatively recent development in photographic printing is the "Bromide" paper. This paper, as already stated, is coated with a sensitive emulsion of silver in gelatine, much the same as the film used on the dry-plate. In this process the Bromide, in place of the Chloride of Silver, is used as a sensitive salt, and as it is much more sensitive to light than the former, the light of day is not necessary in the production of the image; in fact, it cannot be used ordinarily, as it is too intense. The prints are usually made by exposure to a gas jet or lamp-light for one or more seconds, according to the density of the negative. The great disadvantage with Bromide paper is that the image

is not visible during printing, and cannot be watched to judge the exposure; it is brought out by development in a chemical bath after exposure, as in the case of the negative. The authors are able to regulate the time to a nicety by making a long exposure to a weak light, such as made by a candle, instead of a short exposure to bright light. It is our practice to have in the dark-room a table and a candle or incandescent electric light with a ground glass globe. If the former, the dark lantern is lighted, and in the security of the ruby light the package of Bromide paper is opened, a sheet removed, and placed in the frame with the right or sensitized side of the paper in contact with the negative, and the remaining sheets carefully replaced in the envelope. The frame is now set *up on edge* on the table facing the unlit candle and about 18 inches away from it. The candle is lighted and an exposure of thirty or forty seconds made; the candle is then extinguished and the sheet of paper developed as described later. If the image develops up harsh and with no detail, but is black and white, the exposure has been too short, and can be lengthened according to judgment. If the image comes up quickly and is full of detail but weak and gray, and the high-lights tinted, the exposure has been too long. The advan-

tage of the weak light consists in the great latitude possible in regulating the exposure, which is impossible with a bright light where the exposure is only a fractional one at any time. It is understood that all the operations must be conducted in the dark-room with the same care regarding white light that is used in developing dry-plates. After developing, the prints are washed in two or three changes of the clearing solution, followed by four changes of water, fixed in Hypo, and given a thorough final washing, as with other silver papers.

**DIRECTIONS FOR WORKING BROMIDE PAPERS.** In giving detailed instructions for making these prints, we cannot improve on the directions given in a pamphlet sent out by the manufacturer of Nepera Bromide Paper, and therefore quote the following :

*Exposure.* On account of its great sensitiveness, which equals that of a dry-plate, Bromide paper should be handled only in good ruby light. If this elementary recommendation is not followed, much annoyance from "foggy" prints will be the result. For enlargements, daylight is generally preferred; while for contact prints the usual sources of artificial light; viz., candle light, kerosene lamps, gas light or electric light, can be used with more advantage on account of greater steadiness. The time of exposure depends on several conditions: Intensity of the light, distance from the light source, quality of the light, and density and color of the negative.

Yellow artificial light—candle, kerosene or incandescent electric light—on account of its smaller actin-

ism, requires a longer exposure than daylight or arc light.

If a candle is taken as a light source, it will require about 25 to 35 seconds' exposure for an average albumen negative placed at eight inches distance from the burning candle. For an incandescent lamp of 16-candle power, placed at the same distance, it would take only one-sixteenth of this time, say about two seconds.

*\* If the negative is placed at a greater distance from the light source, the time of exposure will increase in the same proportion as the squares of the distances increase. That is, a negative which prints in 25 seconds at 8 inches, will require four times 25 seconds or 100 seconds at 16 inches, and nine times 25 seconds or 225 seconds at 24 inches.*

*Developers.* Although Bromide paper can be developed with Eikonogen or any other developer, we recommend, however, as most reliable and giving the purest whites, the Iron Oxalate developer, and our Metol Quinol developer.

#### IRON OXALATE DEVELOPER.

##### *Solution 1.*

Neutral Oxalate of Potash . . . . .	16 ounces
Hot Water . . . . .	48 "

##### *Solution 2.*

Proto Sulphate of Iron . . . . .	8 ounces
Hot Water . . . . .	24 "
Citric Acid . . . . .	15 grains

Let both solutions cool off before use, and put them in separate bottles, where they will keep for months in good condition. The Iron Solution should be kept well corked, and should not be used if not perfectly clear and green.

Immediately before use, measure off four volumes of Solution 1, and pour one volume of Solution 2 into it while stirring. Do not pour Solution 1 into Solution 2, as this will not give a clear solution.

We do not recommend any Bromide of Potassium as restrainer; we would advise, however, for the same purpose, the addition of one-fifth or more of old *but clear* developer, which acts as an effective restrainer,

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\* Italics our reconstruction.

gives better blacks, and allows the image to appear gradually. It is always better to start development with a weak developer, containing some old developer, and afterwards, when the image has begun to appear, fresh developer can be added in required quantity; and finally, if necessary for bringing out the last details, an entirely fresh developer can be used. If you have no old developer, then add one or two drops of a 10 per cent. potassium bromide solution for every two ounces of developer.

Development should be carried out in the proper time. Too quick development will give greenish blacks and flat prints; too slow development may produce yellowish whites.

After the paper has been exposed, lay it in a tray with clean water and let it soak, avoiding air bubbles, until it is perfectly limp; pour off the water, flow the developer over it in one sweep, and rock the tray to and fro, so that the paper is always evenly covered. The picture will gradually appear. As soon as the details are out, and the desired strength is attained, pour the developer off and apply the following

#### CLEARING SOLUTION.

Acetic Acid No. 8 . . . . .	about 1 drachm
Water . . . . .	1 quart

This clearing solution should be flowed over and under the print and the tray rocked for about one minute; then pour off, and the same operation is repeated at least twice, taking care to wash the back as well as the face of the print, which will prevent the iron in the developer from precipitating on the print. The print is then to be rinsed in four changes of fresh water and submerged in the following solution, contained in a separate tray, for at least 15 minutes longer:

#### FIXING-BATH.

Hyposulphite of Soda . . . . .	8 ounces
Water . . . . .	64 ounces

Do not expose the print to daylight before it is entirely fixed. After the print is perfectly fixed, it should be washed thoroughly in repeated changes of water for about one and a half hours.

## METOL QUINOL DEVELOPER.

Warm Water . . . . .	750	parts, or 27	ounces
Metol . . . . .	1	" "	15 grains
Sodium Sulphite Crystals . . . . .	40	" "	1½ ounces
Hydroquinone . . . . .	4	" "	1 drachm
Potassium Bromide . . . . .	¼	" "	4 grains
Potassium Carbonate . . . . .	20	" "	5 drachms

Dissolve the chemicals one after another in the same order as indicated by the formula. This stock solution will keep indefinitely in well stoppered bottles. For use, dilute a sufficient quantity with an equal volume of water. This diluted developer can be used over and over again until it becomes discolored or works too slowly. In the latter case some fresh developer may be added to it. Be careful not to mix any iron developer with this one, and use clean bottles and trays.

Metol Quinol will give a steady and gradual development. If the print has been exposed properly, it will take a few minutes before it comes up to the required strength. Strong developer will bring out the print more quickly, but it may cause grayish blacks and loss of "snap." After developing, wash and fix the print in the same way as described above for the Iron developer. But the Acetic Acid clearing solution can be omitted with this developer. The greasy feeling produced by alkaline developer solutions may be avoided by dipping the fingers in diluted acetic acid or vinegar.

To avoid yellow prints, the following points must be observed :

The Iron Developer must be acid, and entirely clear.

Too long development, owing to under-exposure or too weak developer, must be avoided.

The clearing solution must be used as directed.

Fresh Hypo solution is required every day.

The washing must be thorough after fixing.

The Prints must not remain in the wash water over night.

The Water should be clear and free from Iron.

*Causes of Failure.* Flat or mealy prints are caused by over-exposure, alkaline oxalate, excess of iron, or a developer too cold, or too old, or muddy ; also, by too hard water.

Image developing too rapidly, and becoming too dark, is caused by over-exposure or a too strong de-

veloper. The contrary will happen if the developer is too weak or if the prints are under-exposed, or if too much old developer is used, or if too much bromide has been added.

General foggy appearance may be caused by the paper being light-struck, or the developer being too strong, or by impurities in the developer; under-exposed and over-developed prints will show the same effect.

General yellowish stain may be produced by a muddy developer, too long development with a weak developer, under-exposure, imperfect washing after development, impure water, old or exhausted Hypo bath, or the prints becoming light-struck before they were entirely fixed.

Irregular development of the image may be caused by imperfect soaking of the paper before developing, or by not distributing the developer evenly over the entire surface of the paper.

Black spots or finger marks appearing while developing are generally produced by Hypo-soiled fingers.

Hypo is the enemy of Bromide paper, and should be carefully avoided before fixing, as the smallest trace of it which enters into the developer or the trays will cause stains or spots.

Greenish blacks are caused by over-exposure, incomplete development, or too much old developer.

Blisters are caused by air bubbles appearing between the paper and film, causing the latter to loosen itself from its support. Whenever they appear, the surest way to save the print is to perforate the blister, by means of a needle, so as to let the air escape before the blister has become too large. Blisters are the result of handling the paper too roughly in the baths, causing them to wrinkle or to fold; they are also caused by too strong Hypo or Acetic Acid, or a too great difference in the temperature in the different baths.

A good preventive for blisters is the use of a little common salt in the first wash water after the Hypo. Blisters will never occur if all the baths have the same temperature, and if the Hypo is not too strong.

Bromide prints are as permanent as en-

gravings, and soft, beautiful effects in either gray, black or sepia tones can be produced, according to the exposure and development.

Prints on Bromide paper may be colored to resemble water colors by using a very weak solution of gelatine and water as a medium for the color. Take a small quantity of gelatine and allow it to swell in cold water until it is thoroughly softened, then pour off the cold water and add hot to the softened gelatine, placing the vessel over the fire and stirring until the gelatine is dissolved and incorporated with the water, which should not be thick when cold, but only slightly sticky. This solution is used in place of ordinary water for working the colors. Never *boil* a solution of gelatine, as this is not necessary, and destroys its adhesive qualities.

PLATINOTYPES are among the most beautiful and artistic of photographic reproductions, and as the image is as permanent as the paper on which it is printed, they have decided advantages over the ordinary silver prints. The keeping qualities of the coated paper before use are somewhat poor, however, and as the image is only partly printed out, and finished by development, the handling of the paper requires rare judgment. In this country the paper is manufactured by Willis & Clements, and is for sale in sealed tubes in the principal

photographic stores, the necessary developing salts being furnished with each order of paper. In printing, place the negative and paper in the frame in the usual manner, and expose to diffused daylight until the image appears fairly well defined, of a grayish orange tint, with detail slightly visible in the middletones. When printing from thin negatives care must be used not to over-expose; as soon as the image is faintly visible it may be enough. The paper is removed from the frame and, the developer having been mixed according to the directions accompanying it, the print is *floated* on the developer as in silvering paper; *lift it quickly* to see if air-bells are present; if any, touch them off and refloat; the picture will develop up rapidly, and when considered sufficient the development is stopped by placing it in the acid clearing-bath.

CLEARING AND WASHING. The clearing-bath consists of

Water . . . . .	60 ounces
Muriatic Acid (C. P.) . . . . .	1 ounce

Give the prints three changes of acid baths of 10 minutes each, and follow with three good washes in plain water, say 15 or 20 minutes altogether. For more detailed instructions, our readers are referred to an interesting little pamphlet published by Willis

& Clements, from which we have quoted in part.

FERRO-PRUSSATE, OR BLUE-PRINT PAPER. Probably no photographic process offers as many chances of success to the beginner as the "Blue Process." This is not because the work needs less care, or is tolerant of slovenly methods, or the finished prints are inferior even when at their best; such an admission would be a libel on an already much abused but beautiful process. The sole reason lies in the simplicity of the manipulation and the absence of troublesome baths. The paper may be prepared by the amateur himself, or he may use with success some standard brand found on the market ready prepared. The paper, if properly coated and stored in a dry place, will keep in good condition for many months. The prepared paper, if bought from a reliable dealer, will be found highly satisfactory and very low in price, the 4 x 5 size costing about 20 cents for 25 sheets.

This paper, as now made by the larger manufacturers, is coated by machinery on the highest grade of plain photographic stock, specially sized at the mills in Rives, and gives results which cannot be approached by the old methods. For those who desire to prepare their own paper, we give the following directions: Select a few sheets of your

plain Rives paper, such as you used for salting, but which have not been in the dampening box, mark the right side so you will know it, and tack a sheet to a board, right side up. Prepare the following solution, and keep it from the light:

Red Prussiate of Potash . . . . .	1	ounce
Citrate of Iron and Ammonium . . . . .	1½	ounces
Distilled Water . . . . .	10	"

Mix thoroughly and filter; this solution will have a deep wine color, and dry on the paper a lemon yellow. If the solution is green and has a precipitate, the Ammonium Citrate of Iron is old and spoiled, or you have been given Citrate of Iron instead. The chemicals being ready, they are poured into a bowl, and with the aid of a camel's hair brush about three inches wide and *bound in rubber*, the solution is spread upon the paper by stroking first lengthwise and then across, being careful to cover the whole surface as thinly and evenly as possible; this will be difficult at first, but will come with practice. The paper is immediately lifted from the board and hung up to dry; if allowed to remain on the board, the chemicals will strike through and give flat prints. It is advised by some to coat the paper by floating, but it is very difficult, as the solution flows to the bottom of the sheet in drying and causes that

part to be heavy while the top is very thin. Heavy drawing paper having a rough surface gives, with bold or large negatives, a very handsome effect, and for marine views, especially if large, the results are superb, but the drawing paper must be used the day it is coated, as it has chemicals in its sizing which cause the coating to spoil after a few hours. This does not affect the finished prints, however, if they are completed before the paper spoils.

Having prepared our paper, or purchased a package of some standard brand, we print as follows: Place the negative, previously dusted, in the frame; on this lay the sheet of Blue-Print Paper, coated side in contact with the film; next lay down the pad, and on all, the back-board of the frame, which is then clamped in place. Carry the frame to the window and print in sunlight unless the negative is very thin, as this paper prints more slowly than silver or platinum paper. After a few minutes' exposure, examine in subdued light, and the paper will be found to have an olive-green color in the shadows, and lemon yellow in the high-lights; replace the back-board and continue printing until the deep shadows corresponding with the thin parts of the negative take on a bronzed color, but *not* until the *whole picture* stands out *deeply bronzed*;

when the proper depth is reached, remove the print from the frame and place it in a tray of clean water, *making sure* that the whole surface is wetted immediately, and that no air bells have formed. So sensitive is this paper that the moisture which strikes through from the back of the sheet, in the parts not wet, will spoil the coating in these spots in a few seconds, and they will appear as blue stains in the finished print, and unless you are very observant you will be puzzled to know the cause. The manufacturer is usually censured for these spots. After immersing the print, throw the water over it and keep it in motion. The chemicals will be seen to float off in a cloud; after five minutes' washing, change the water; repeat this in five minutes more, and then turn the prints face down and allow them to wash for not less than 30 minutes. It is absurd to shorten the washing because the prints are washing down too light, or the chemicals leave the paper entirely, and nothing remains but a white sheet. What is needed is a longer exposure to light. The water does not *bleach* the print, but fixes it, and brings out the beautiful blue color of the chemicals which have been acted on, and washes away those not affected by light. If after washing, the print is dark and a dull blue color, with the high-lights tinted, the

exposure has been too long. Shortening the washing of the print will cause it to fade and the high-lights to turn gray, the Iron not being thoroughly eliminated.

If the prints are not satisfactory, look to your negative before condemning the paper. Remember that no process can give a print full of detail and even in gradation if these qualities are not in the negative. If the paper prints blue and washes out white it is all right, and will give beautiful prints if properly treated. After washing, the prints are hung up to dry and as the surface has no glossy coating, they will not curl, and can be folded without injury. Don't try to burnish them or enamel the surface; it will not improve the appearance, and certainly will rob them of their charm for the artistic eye.

There is a popular impression that Blue-Print paper is not sensitive, and can be handled in white light with impunity. Don't believe it; even subdued light will injure its tones and keeping qualities; treat the paper with as much respect as you would silver paper, and it will reward you with prints which will be faithful reproductions of your negatives, rendered in a way that cannot fail to please, and to their first charm will be the added pleasure that they will not fade or turn yellow with age.

In purchasing blue paper ready prepared, do not reject it if the coating has turned to a brown or light olive color, as it will do this with age and yet wash out white. Paper which has turned to a greyish blue color is spoiled. The color, however is very deceptive to the inexperienced, and no paper should be condemned until it has been tested by washing in *clean* water for a full half hour ; if it refuses to wash out white, it has spoiled. Paper which has turned a little, and washes out grey, is nicely adapted to some views where a soft grey tone is desired and the brilliant china-white tones of the fresh paper are objectionable.



## PART III





## SECTION 1.



### MOUNTING.

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WHEN the prints are fixed and washed, they may be mounted immediately on their permanent support, without drying.

To do this, however, the print must have been studied out as to size, and the paper *trimmed* before toning. It is for the reason that this can so seldom be done satisfactorily, in advance, that prints are generally dried and then trimmed.

Some little art is required in trimming a print, as only the best section of the picture ought to be preserved, and it is necessary to decide what is superfluous and irrelevant. As usually trimmed, the photographer seems to be simply intent on keeping the regular size of the print—in other words, he trims for the *negative* and not for the *picture*. The neatest way to see the value of the picture is to lay it upon the sheet of glass used as a cutting block, and place over it the plate glass form furnished by the supply houses, and

shift the form until the margins of it define what you wish to cut from two sides, regardless of the others. When these are trimmed with a moderately sharp knife-blade, the glass can be shifted on the print, and, without much difficulty in keeping the lines square or at right angles, another side can be trimmed, and so on in turn. In this way you may trim a 5 x 8 print down to 4 x 6½, or some other size, but if the right effect governs your cutting, it cannot help but give you happy results. Some people, perhaps, would regret the "waste" of paper; their diagnosis of economy is at fault. It is well to trim all the prints you have ready at once, and, clearing away the cuttings, place the prints in clean water to soak a few minutes until limp. Don't *soak* them in the full vigor of the word, but only enough to make them limp. Then gather them and place face downward, one upon another, on a sheet of glass. Take a piece of blotting paper and gently press the superfluous moisture from the pile of prints.

The mounts, or cardboards, are then to be brought out and placed to one side, and the upper corners of the point for the print marked upon each one with a faint pencil tick, to insure placing it correctly. Then, with a flat brush cover the back of the topmost print with Higgins' or any good photo-mounting

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paste, and be careful that the *edges* and the whole back of the print are faithfully covered with the paste. The print is then to be carefully raised by one corner (a dull knife-blade is handy, for albumen paper tears easily when wet), and turned and held suspended over the mount. Allow the top edge to drop until the corners correspond with the pencil ticks on the mount, and then gently lower the whole print until in contact with the card. Take a piece of clean, white linen, not starched, and place over the print, and gently rub the surface with a flat-bladed paper cutter or some smooth object, rubbing *from the center* of print towards the edges, so that superfluous moisture or paste are forced there and absorbed by the cloth. Look at the print frequently to be sure that it is smooth, and that the edges are adhering. Then lay the mount aside to dry, making sure, before doing so, that no scraps of paste are around on the mount or print; if any are present wipe them off with a soft, damp sponge. A superior device in mounting is the neat print roller manufactured by The Scovill & Adams Co., of New York, and called the "Champion." With this roller the air-bells are rolled out and the surface of the paper kept from being scratched or marked as when using the paper-cutter.

All prints have a tendency to curl the mount unless kept under pressure. A simple way to prevent this is to paste on the *back* of the mount a piece of tough white paper, corresponding in size with the print. The contraction of this paper opposes the shrinking of the print, and keeps the picture nearly flat.

It must be remembered, with albumen paper, that it always stretches *in one direction*, and that in some subjects this creates bad results by actually *changing the proportions of the picture*. With portraits this tendency makes itself decidedly prominent.

Professional photographers always *burnish* their prints, hence the high luster and polish found on the surface of their work. The burnishing is done by passing the mounted photograph between steel rollers, which are heated by a lamp. This reduces all the slight inequalities in the surface of the picture, and gives it a finished appearance.

The choice of mounts or card supports for photographic prints is very much a matter of personal taste or whim. All kinds, colors, sizes, etc., may be obtained of the dealers. Thick mounts are generally made with beveled edges, to do away with the clumsy appearance which a very thick card edge gives.

If you wish to mount a print on thin paper

and prevent curling or wrinkling, it can be done in the following way: Take the print to be mounted and smooth it with a warm flat-iron, and indicate on the paper the position of the four corners of the print just inside of its outer edge. Make a thick solution of gum arabic, and, with a ruling pen, draw a wide line of mucilage from point to point. Allow the gum arabic to become sticky, and then place the print in position under weights. When dry the mount will keep smooth and not curl.

The mounting of bromide prints, and various methods of obtaining different effects in doing so, are fully described in the circulars accompanying the makes of different manufacturers.

Blue-prints can be mounted at any time, and require no more careful handling than an ordinary print or engraving. They keep very flat, and need no extra care of any kind.

## SECTION II.



### PRESERVATION.



NEGATIVES are best kept singly in stout bags or envelopes, the full notation concerning them being written upon the outside. They are thus easily found, and scratching is avoided.

PRINTS can be kept in many ways. They can be mounted by simply pasting the corners in an ordinary scrap-book of the limp page kind; or a better method is in vogue, in which *double leaves* uncut at the outer edge are substituted for single sheets in the book and the corners of the print are caught under a diagonal knife-cut made at the right point in one thickness of the leaf to receive the corners of the print which you intend placing there. This has two features of merit. You can remove any print at any time without damage to the book or picture, and in turning the flexible leaves the print conforms to the curve of the bend of the book, slightly moving between the corner slits. When the prints are

pasted at the corners they are liable to wrinkle if they be silver prints, and a crease soon develops into a rupture of the paper. Besides, they can only be cut or torn out. In mounting prints in flexible albums or scrap books, the prints may be soaked in a weak solution of glycerine and water, which will make them more limp and less likely to curl.

If the amateur does not object to bulk, and has no desire to remove his prints from the album, there are all sorts of expensive and inexpensive albums made in which the leaves are simply card-mounts held to the binding by flexible muslin strips, and are removable for convenience in mounting. The prints are mounted on these cards precisely as on the single cards. The main objection to the card albums, as has been said, is their bulk and weight. Where many prints are to be preserved, this will often be found a serious annoyance.

A series of prints, mounted on cards, may be very neatly preserved in good shape by punching holes in the edge of one margin with an eyeletting punch, and forming a flexible hinge of ribbon or cord passed through the holes. A tough paper cover, made of felt wall-paper, or something similar, neatly lettered, adds to the attractive quality, and keeps the dust off the prints.

If you have many prints of one size, or many prints mounted on one size card mount, they may be arranged in boxes of the telescopic order, such as are sold to contain letters or business papers. The prints can be slidden into the box, and the tight case excludes the dust. A labeled row of these standing in a bookcase is unobtrusive, and gives easy and ready-reference access to the prints.

These suggestions are offered simply to create a starting point for the beginner, who will want to develop some pleasing method of his own for keeping his photographs, a method in which he will feel the pleasure of his proprietary rights. The main thing in all ways of preservation is to exclude *dust* and *dampness*.

### SECTION III.



## ENLARGING.

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SMALL picture, such as that made by a 4 x 5 or 5 x 7 camera, has many pleasing and attractive points. It is not too small to show a great deal of detail, and the picture is so compact that the eye readily takes it all in. Besides this, economy in plates, sensitive paper, etc., are prudent virtues.

But the desire for a larger showing of some special picture will always speed the inclination to purchase a larger camera. Without making this further investment, however, and afterwards finding that your larger apparatus grows dusty because it is so heavy to cart around, while your smaller box has incessant service, there is a method of procuring the larger picture from the small plate and getting a result as attractive as if given by the big, expensive camera and plates. Recent years have seen the development of methods of photographic *enlargement*, and the writers propose

to give a few hints as to how they have worked one of these methods inexpensively.

IN PHOTOGRAPHIC ENLARGEMENT, by which we mean the printing of a large picture from a small plate, the *negative* image is projected onto the surface of a piece of bromide paper, instead of being in contact with the paper in a printing-frame. The negative is placed back of a lens in the same way that a magic lantern slide works, and the image focused to the size we desire, on a white screen. In the magic lantern the slide is a *positive*, or a print on glass, and the image cast in this case is the picture as a print would show it; but in enlarging, the image cast on the screen is the reverse of nature, the bright parts of the picture being dark and the dark parts light. A tree, for instance, seen on the screen, as cast by a negative, is a mass of blazing *white* boughs and trunk, and so the reversion follows with all objects. As the sensitive bromide paper in printing from the negative prints black where the light strikes through the thin or clear parts of the negative, so the same paper prints the enlarged image of the negative cast upon it.

All of the light used in the operation must be *behind* the negative, and everything else, the camera, the operator and the screen for the bromide paper must be in darkness as

sincere as the darkness of the dark-room. As the piece of bromide paper must be spread out on the screen, and it is so sensitive to light, the necessity for this will be seen at once. Of course, the dark room light may be in use all the time to assist in the operations.

Two sources of light are convenient for the amateur; one of them is sunlight, free to his use, without cost. Enlarging by daylight is quicker than by artificial light, although more care and *stopping down of the lens* is required to produce soft tone effects. A window of a room having no other source of light must be chosen, and a light-tight screen made to fit in the whole extent of the frame. This can be done by making an ordinary frame of one by two-inch strips, and the whole area covered with black silesia in double thickness, or a combination of one thickness of black and one thickness of red silesia. (This is the cheapest material we know of.) If the frame fits against the jamb, sill and head, the sash bead forms an offset, and there ought to be no crevices left for sunbeams or chance rays of light. Before the screen is placed in position, the lower sash of the window should be raised and a *mirror* at least eight times larger than the area of the plate you are enlarging from placed at an angle outside the window, so that its reflection, when you look at the slanting mirror on a

horizontal line, shows nothing but the sky in the looking-glass. We will assume that a table or support will bring the *center* of the back of your camera at a height of four feet from the floor. The mirror should then be held on its slant so that the center of its diagonal height will be the center of the back of your camera when placed upon the table. Using this same center point, a hole is cut through the silesia of the screen about an inch larger than the entire back of your camera, and a drawing cord of rubber elastic inserted in a seam made around the opening. The silesia should have some fullness on its frame, so that the rubber elastic can contract the opening at least one-third of its area and can be made to bind tightly around the back of your camera.

The table is now pushed close to the window and the camera, extended, and with the lens pointed towards the inside of the room, and the back towards the window, is placed upon it. As four feet is the height we have assumed as most convenient for the operator, and as tables are rarely made that high, a piece of planed board about twelve inches wide, and nailed to some firm supports, must be placed upon it, and the extra height thus gained.

An ordinary plate-holder offers the easiest

method of holding the negative at the rear of the camera, but as the light must pass *through* the plate, the septum or middle division in a holder must be cut out neatly to a line which will be an eighth of an inch less than the size of the plate all around. The plate thus held is sure to be parallel with the lens, and the slide can be used at will, to shut it off from the camera. Of course the holder is sacrificed in the cutting, and can only be used for this special purpose thereafter.

The clear sky in the mirror will now be reflected on the back of the negative, furnishing an illuminant of immense power, too strong and not sufficiently diffused for the purpose. It is necessary to place a piece of ground glass at least two inches back of the negative. *If it could be closer*, and your camera has a ground glass frame which does not fold but remains back of the holder when it is in the camera, everything would be complete. But you *must* have the ground glass further away, and as we cannot know the kind of camera you are operating, we must leave your ingenuity to work unaided, except by telling you what we did ourselves. In our experiments the camera used was an ordinary one of the simplest type, in which the ground glass *folded down* at the back, and the holder dropped into its place and was secured by a

catch at the top. This being the case, we removed the ground glass frame entire and set the plate-holder, altered for the purpose, in its place. An ordinary shallow cigar-box, minus lid and bottom, and a little larger than the back of the camera, held the ground glass as a frame, and a sleeve of black cloth about 6 inches long was glued to it, with the elastic in its outer edge. The cigar-box frame, *painted black inside*, was permanently fixed to cross strips in the window screen and a light-tight joint made around it. The camera, with its plate-holder, could then be pushed up to the cigar-box frame with its piece of ground glass at the outer side next to the window, and the rubbered-edge of the sleeve slipped over the back of the camera, making a light-tight joint.

These arrangements made, the *room itself is like a big camera, and you are inside of it*. With the cap off the lens, the bright, queer looking *negative picture* will be seen reflected on the opposite wall, more or less distinct as the chance position of your focus gives it. If the wall is white, and not too far off, you can probably get a sharp image by moving your camera-front backward and forward until you arrive at definition, just as in taking a picture. The distance will, of course, have to be reduced to suit the size of your bromide paper,

so that some movable screen must be used which can be shifted backward or forward in relation to the camera until the right conditions are established. The three points to be fixed are the distance between your lens and the negative (done as in focusing with the camera in the field); the distance between the lens and the screen or support on which the bromide paper is to be placed, and, necessarily, the size of the image on the screen. A very little experiment will enable you to make some general calculations which will help you to avoid experimenting afterward.

There are several things necessary to secure perfect exposure, and they must be carefully attended to. There must be no shadows on the mirror; if the sun is overhead, the mirror may be in the sunshine if it is *all over it*; the mirror must cast the light on the ground glass; the negative, lens and screen must be absolutely parallel with each other. *Any deviation* in the last mentioned condition will result in *distortion*.

It is difficult to get the screen square with the lens and negative, and yet have it possible to shift the screen backward and forward. Personally we overcame the difficulty by having the board support of the camera long enough to receive the screen (for which purpose we used a light drawing-board), and to

have it arranged on a sliding frame controlled by the square edges of the plank support, the camera being kept square by confining its bed between two strips nailed to the plank. The board and screen can easily be tested with a right-angled triangle. The camera and screen once squared, always held the same relations, no matter how much the screen was shifted backward or forward. In the regular apparatus, made for the purpose, the screen travels on a floor track with castors and running gear.

When the right focus is established for the size of the enlargement, and the negative picture is sharp and clear on a piece of white paper pasted on the drawing board, the corners of the image can be marked with lead pencil ticks and the lens cap replaced, shutting out the image and the resulting reflected light. If the dark lantern is lighted the package of bromide paper can be opened and a sheet removed and placed on the screen at the position indicated by the pencil ticks, being stretched smoothly and held by thumb tacks in sufficient quantity to keep the edges from curling. (It is best to have the image a little *smaller* than the sheet of sensitive paper.) This done, the lens cap is removed and the exposure made on the paper. The wisest way to judge of the time is to expose on some

small strips of bromide paper which will take a part of the image, timing each one differently, then developing and noting the result. It might also be wise to mark the time in pencil on the back of each strip, so that you will not lose track of it. The use of the stops in the lens is a question to be considered, but the smaller stops can hardly do service, since they prolong the exposure to a wearisome length.

When the exposure is made the lens is covered with the cap and the bromide paper removed from the screen and placed in a light-tight receptacle until you wish to develop it. A new negative may then be placed in the holder, and the work proceeded with at your pleasure.

The development of the enlargement is exactly the same as the development of a small bromide print, although of course you will need trays of adequate size.

Almost any kind of lens can be used in this work, but view lenses are the best, with the whole opening slightly stopped down. Wide angle lenses can be used where the space for working in is restricted.

To make enlargements at night requires a considerable expenditure in the matter of a pair of condensing lenses whose circle will cover the corners of your negative to be en-

larged from. To use them the writers made a frame of half-inch poplar wood about six inches deep and an inch larger all around than the diameter of the lenses. Two boards served as mounts or supports for the glasses, each board having a hole the exact area of the lens and the glasses held in place by small brads. The lenses thus mounted were placed in the box frame, being held about an inch apart by strips of wood forming a stop bead between the two. This box was placed immediately back of the plate-holder with the negative to be enlarged in it, *without any ground glass* and with about four inches between the nearest lens and the negative. The light used was a regular sized Rochester oil burner without any shade, and with an eight inch reflector placed so that the center of the white flame, the center of the reflector and the center of the lenses coincided. The illuminating power furnished in daylight by the sky, the mirror and the ground glass were thus replaced for night work with the happiest results and but slightly prolonged exposure. The difficulty which may have already occurred to the reader's mind, *i. e.*, how to separate the light from the room in which the enlargements are made, was gotten over in this instance by cutting a square hole in the partition between an out-kitchen and the main kitchen, and

there placing the box frame with the lenses in it. By this means the light was excluded as completely as the daylight in the other method, and as the frame for the lenses was a permanent affair it was only necessary to fit in the lens boards, set up the lamp and camera and screen supports, and everything was ready, while a wood panel closed the box opening when not in use.

For daylight enlarging—if one owns a mirror which can be used—the expense involved will not exceed five dollars, and may be less. For the night enlargement—granting that you have a lamp with as good a flame as the one mentioned—you will only need to buy a reflector costing about half a dollar, the lens boards, which a carpenter can make with a pointed saw, and—the condensing lenses! The pair of these cost, we believe, for use on a  $4\frac{1}{4} \times 5\frac{1}{2}$  plate, ten dollars. In both cases, of course, you need the trays for development, washing and fixing, three in all.

Your enlarged pictures, if you will cultivate a happy stock of patience at the outstart, will yield you a great many dollars' worth of pleasure and satisfaction.





## ADDENDUM





ADDENDUM.



*THE HAND-CAMERA: ITS  
SNARES AND VIRTUES.*



THE growing strength of photography as a popular amusement and relaxation called forth, some years ago, lighter and more diminutive cameras than had previously been made, until the final development on this line was the hand-camera, designed for instantaneous exposures, which were either made while the camera was carried in the hand, or while the box simply rested on any temporary support which might be handy to the operator. One of the strongest objections to photography amongst those who sought it as an amusement, pure and simple, had always been the weight of the apparatus and its cumbersome form, so that in the earlier days of amateur apparatus a most forcible argument was made by showing the old-style artist, pack-laden with the weight of his wet-plate apparatus, and, as the reverse of this the then modern amateur with his natty little

box swung jauntily at his side. Yet these outfits of the '80's are to-day almost as obsolete in respect to weight and compactness as is the wet-plate apparatus. A decade has seen the portable camera, minus tripod, carry the world with the strength of a fashionable fad. To be able to "make a picture," irrespective of the merit in the same, became the devouring ambition of a delighted public, the joy of the plate-maker, and a source of groaning to all those who loved real artistic work.

The hand-camera, the "detective" camera, the box-too-small-to-be-seen-camera, is one of the greatest modern delusions; not, be it said, because the manufacturers always promise miracles, but because the public expects them. In only a few instances are the cameras of this class advertised to do more than they really will; but it must be noted, in passing, that the firms who *do* promise the wonders are a great nuisance and damage to the art on all hands. To the uninitiated it is very charming and agreeable to believe that by expending a few dollars they can produce the beautiful pictures they have seen in portfolios and windows, sans experience, sans skill. It would be interesting to know how many of these adventurous beings have stored away their snap cameras in a loft, or given them to the boys to play with. It requires

but about a month to show the purchaser that a camera only works in partnership with care and study. The man or woman who only pushes the button and lets some one else "do the rest" might well let the business alone, for without experience in the chemical work of photography the negatives are good only by accident, and "the rest" constantly yields a stock of blurred, imperfect pictures from which a kinder heaven would save all of us. Of course, if persons of an inquiring mind simply want the sensation of working a snap-shutter and indulging in the dream that they have taken a picture, any cheap affair will satisfy the craving; but one with an ambition to make good pictures, to really take delight in the work, ought to make a better start with the regular, simple tripod camera, reserving any expenditure for the other sort of apparatus until the technique of the business is well mastered. Cameras are made in which the hand-camera idea is well developed, and they are furnished with ground glass, bellows and focusing rack, all contained in a compact case. They may be carried in the hand and used, under favorable conditions, without a tripod, but they also allow the operator to use them in the legitimate manner necessary to careful photo-

graphic work. These are the so-called "folding" cameras.

For it must not be taken from the foregoing words that a good picture cannot be made with a hand-camera, but that the amount of judgment and skill necessary in using one successfully is much in excess of that required with a regular camera.

The objections to the hand-camera as a rule, and what we may call its snares, are these:

It is too ready for use, and likely to be "fired" without definite or studied aim.

For this reason it encourages carelessness and a disposition to shun study.

As a following of this it establishes a lower standard of criticism as to results.

An abbreviated exposure on all subjects is almost absolutely necessary.

The claim that you can make proper time exposures by regulating the shutter is answered by the objection

That in most of the boxes you cannot focus, for there is no ground glass, and definition becomes a poor rule of thumb.

The results with any merit are therefore made exceptional rather than assured, and the time and labor are lost to the operator.

It would be a curious story if one knew how many people had forgotten to take the cap out of the lens hole in their hand-cameras, when they were excited at the possibility of getting a rare picture. One good story is told of a by-no-means amateur operator,

who, while on a trip in the western states, sought to make a snap-shot of a dusky Indian belle in a state of unadorned nature. He was careful, very careful, in his operations, but when the film-roll was developed at home, that particular section of the panorama was void. He remarked the trouble to his wife, who had been with him at the time. "Yes, I knew you didn't take the cap off," she responded with demure triumph of virtue.

Another traveler toured the Yellowstone, and sought to make his lens drink in all the beauties his exposure roll would hold. He was one of the "some other fellow do the rest" kind, and was thunderstruck when his photographer at home informed him that the roll was blank. "Did he ever take the cap off?" No, he had just pushed the button, and trusted the rest to God and nature.

These be the snares of convenience in a hand-camera!

That no camera with a film roll has as yet been a constant success, or even a partial one, is the experience and belief of the authors. That the film is nearly always false and tricky, is the opinion of a great many thousands of people who have honestly tried to do good work with it. We wish simply to protest against the endorsement of any camera, in the present state of knowledge,

which uses a roll film, unless it be a transfer film, where the backing or body of the negative is not an untrustworthy medium, but paper or some material which acts simply as a temporary support, and from which the gelatine emulsion can be transferred to glass. If it were not for the trouble and risk of failure in the transfer, this would offer the best means of carrying a rolled film in the field.

The only really satisfactory films made are the flat, cut ones, used in a plate-holder the same as glass plates, the film being held flat in a carrier of pasteboard. But no satisfactory arrangement seems to have been devised, as yet, by which these films can be utilized for continuous exposures without refilling of holders, and they cannot be said to play a part in the hand-camera field.

\* \* \* \* \*

It has been said before that one of the impediments to full freedom in photographic work is the amount of time necessary to prepare the camera for action, however much reduced with modern apparatus. Some interesting or beautiful subject, fleeting in character, presents itself; but before the camera and the tripod can be unpacked, the opportunity is lost, and with it the chance for a fine picture. It is here that a camera

ready for instant use offers its seductive presence, and many of us have tried the best machines made, in the vain hope that this once we might down the foes of uncertain definition and exposure. Beautiful pictures have rewarded some of these attempts, but they were always fortunate accidents, as full of chance as the right union of chemical atoms in the philosopher's elixir of life.

It is to be admitted that some of the negatives, if poor, are very priceless as personal possessions. The blurred picture of some face and form too swiftly removed from us forever, the record of some passing moment which can never again frame itself into being. Records of this character throw a mantle of charity over the shortcomings of the detective camera, but they do not do away with the wasted hours, opportunities and money, fruitless in every respect, nor do they defend the vice of the multitudes of bad pictures. Millet's rough sketches are full of value to the art world, but only as testimony in regard to the painter's methods. If he had never produced his real masterpieces, but had kept on with vague dashes of brush or chalk, both he and the sketches would have slumbered unknown.

The nearest approaches to a hand-camera with successful features are the cameras in which the focusing track and bellows are

self-contained in a case forming the body of the box, so that it requires but an instant to open them and throw the front out on its track in full position for work. Used with a glass plate or flat film, and carried in the hand, without tripod, they can be used for quick exposures, and that successfully, if supplied with small levels to insure holding the camera properly. They ought not to be used thus except in special emergencies, but the fact that they can be, places them in the field with the roll-film camera, with the exception of the limitation as to the number of exposures. This limitation, however, is surely a virtue, for it takes away the temptation to heedless and duplicated exposures already referred to.

If virtue in a photograph is represented by careful selection of subject, good definition and full and regulated exposure, the hand-camera is surely but an adjunct to photography, and not an active, useful force in it.





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